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THE AMERICAN GAS LIGHT JOURNAL

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
- June Meeting, Society of Gas Lighting..... 841
- Committee on Nomination of Officers, American Gas Light Association..... 841
- Committee of Arrangements, American Gas Light Association.... 841

EDITORIALS—
- Briefly Told 841
  - The Coal Troubles—Mr. McDonald's "History of the Gas Meter"—Are New York and Brooklyn to Have Dollar Gas?
- Seventeenth Annual Meeting, Western Gas Association - Official Report—Revised by the Secretary - Continued from page 813... 842
  - Second Day, Morning Session—History of the Gas Meter, by Mr. Wm. McDonald—Discussion—*Street Main Pressure, by Mr. Irvin Butterworth—Discussion.
- *The Separation of Water from Tar, by Mr. Theodor Petersen 849
- Oil Wells in Burmah and Siam..... 850
- The Generation of Steam by the Use of Blast Furnace Gases..... 850
- Relative Advantages of Toothed and Smooth Core Armatures..... 851
- ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 852
  - Annual Meeting, Reading, Pa.—A Syndicate Wants to Control the Chicopee (Mass.) Lighting Supply—Annual Meeting, Port Hope, Canada—Mr Letang Owns the Jackson (Cal.) Company—Annual Meeting, Mount Pleasant, Pa.—The Pennock Electric Company—Mr. Leggett to Act as Receiver for the Le Mars (Iowa) Company—The Louisville Company Sells Its New Stock—Mr. Fulton's Electrical Contrivance will Not Work—Public Lighting, New Brunswick, N. J.—Cox's Gas Flow Computer—The Louisville Company to Charge Meter Rent—Sale of the Albion (N.Y.) Works—More Proposed Opposition for Washington, D. C.—Taxes Paid Per Thousand by the Massachusetts Companies—Annual Meeting, Camden, N. J.—And Other Items.
- The Market for Gas Securities 853

[OFFICIAL NOTICE.]

June Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, June 8, 1894.

The June meeting of the Society will be held at the works of the New Haven Gas Light Company, New Haven, Conn., on Thursday, June 14th.

FRED. S. BENSON, Secretary.

[OFFICIAL NOTICE.]

Committee on Nomination of Officers, American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., May 25, 1894.

I hereby give official notice that, at a meeting of the Council of this Association, held at Cleveland, O., May 15, 1894, there were appointed (as per the appended list) members of the Committee to Nominate Officers for the Association for the year beginning October 19, 1894, said Committee to report to the Association on October 17, 1894, at Washington, D. C.:

F. H. Shelton (Chairman), Philadelphia, Pa.; M. S. Greenough, Cleveland, O.; D. H. Geggie, Quebec, Canada; F. S. Richardson, North Adams, Mass.; G. T. Thompson, St. Louis, Mo.

Respectfully, A. B. SLATER, JR., Secretary.

[OFFICIAL NOTICE.]

Committee of Arrangements, American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., May 25, 1894.

I hereby give official notice that at a meeting of the Council of this Association, held at Cleveland, O., May 15, 1894, there were appointed (as per the appended list) members of the Committee on Arrangments for the 22d annual meeting of this Association, to be held at Washington, D. C., beginning on October 17, 1894:

C. B. Bailey (Chairman), Washington, D. C.; J. S. McIlhenny, Washington, D. C.; Wm. Henry White, New York City; John McIlhenny, Philadelphia, Pa.; T. J. Hayward, Baltimore, Md.; C. H. Dickey, Baltimore, Md.; Frederic Egner, Norfolk, Va.; A. B. Slater, Jr., Providence, R. I.

Respectfully, A. B. SLATER, JR., Secretary.

BRIEFLY TOLD.

THE COAL TROUBLES.—One doesn't mind greatly when history repeats itself, since the majority of those who have managed to live longer than one or two generations are up to the knowledge that unpleasant conditions seem to have the facility of repeating themselves with far greater frequency than do the conditions which are pleasing; or, might we say, profitable if not pleasing. One, however, does mind the recurrence of yearly—and very little history is made in a year on the average—disturbing factors, and minds them all the more when the irritation or loss produced by their recurrence is great enough to prevent one from enjoying the solace that springs from the accepted belief that familiarity

breeds contempt. In the past six years, three important strikes of the miners of American bituminous coal have gone into history—that is, two have so gone and one is getting ready to go—and each of these interruptions in the regular supply of coal has interfered much with the makers of coal gas; nor has the miner profited a bit as the outcome of his struggle. Admitting, then, that the gas maker has not profited nor the miner gained, who has been the gainer, then? The only remaining one to be considered is the transporter, and it would require much assurance on the part of anyone to claim that the transporter has been enriched. Where lies the difficulty? Who is responsible for the discontentment and chaos which reign? There is coal enough within easy handling range to supply the markets of the world, still we are confronted by the anomalous condition that steam coals from Cardiff, and gas coals from Canada, and even from Newcastle, are at the present time being received in New York and are being distributed by shippers over waterways that enable them to reach their customers, who are either fortunate or unfortunate enough to have time contracts with such shippers. Well, if steam raiser, gas maker, miner, transporter and shipper are all in a losing game just now, it seems that only one conclusion can be reached—which is that we have too many railways and too few navigable and dependable waterways. To the disparity between the two roadways, we may also add that much, very much, of the disorder and disagreement must be traced to broken commercial faith between the railroads, the managers of some of which prefer the shady plan of pledging themselves at a conference not to do that which, the conference over, they at once proceed to do. In time the difference between the promise at a conference and the performance outside of it must come to the surface, with the result that all pledges are thrown to the winds and war begins. Then the railroad which has the least to lose grinds its men again, with the result that the already well-pinched toiler refuses to stand the grind, preferring to starve in idleness rather than to be crucified in work that returns to him a pittance not sufficient to furnish him food. The coal gas makers of the country, who are all willing and anxious to keep up the letter of their contracts with their coal factors, are about tired of their uncertainty in respect of coal supplies, and naturally will look for relief in the direction that seems the surest and most likely to last, and once out of the fold their reconversion might be a difficult matter. All that they need is coal, or to know the price and certainty with which such commodity can be furnished them: failing which knowledge they will certainly venture in other directions, where the chances are a trifle less dubious.

Mr. McDonald's "History of the Gas Meter."—The paper read by Mr. William McDonald, of Albany, N. Y., before the last meeting of the Western Gas Association, on the "History of the Gas Meter" (it is given in full in our current official report of the proceedings), is full of interest. In the first place, it is well put together, and its figures respecting the times of the beginning, continuation or amalgamation of the different meter-making firms in this country, are authentic; and the story is told in easy and unconceited fashion. Apart, however, from its historical value, the paper has something in it of much greater interest to American gas makers, and that interest lies in the intimation that protection for American industry really was protection in so far as it might apply to the making of gas meters. As Mr. McDonald says, after 1864, when the Government placed a 40 per cent. *ad valorem* duty on meters made in foreign countries, the business of gas meter manufacturing in this country began to prosper. The price of an ordinary 3-light meter then was something like $10; but meanwhile the advance in the art of their making has been so pronounced that at the present time a 3-light meter sells for 50 per cent. less, and not only so, but the quality of the goods has been increased by 25 per cent. In other words, the meter of to-day sells at one-half the price it commanded 30 years ago, while the meter itself is one quarter better than it was then. And the proof that this is so is found in the fact that the English gas manufacturer actually pays more for his meters—in good, hard cash—than does his American contemporary, and that the meter of the latter outlasts the former, either in respect of accuracy or life.

It looks that dollar gas is shortly to be a fixture in the cities of New York and Brooklyn, and that the rate will not be imposed by means of legislative enactment, but rather by the results which have followed the unfortunate cuts in prices in Brooklyn and in the annexed district of this city. One or two of the Brooklyn Companies, having made the trial, claim that there is more money in gas in their districts at $1 than there was at the $1.25 rate. We say "unfortunate cuts" advisedly, for the average gas distributed in New York and Brooklyn during the past five years has undoubtedly been of higher candle power and of greater freedom from impurity than any other gas sold in the world—and the world is a big place. It would be a pity if the candle power had to suffer in the readjustment of rates.

[Official Report.—Revised by the Secretary.—Continued from page 813]

SEVENTEENTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

Held at Cleveland, Ohio, May 16, 17 and 18, 1894.

Second Day—Morning Session.

The President—The next paper will be that of Mr. William McDonald, of Albany, N. Y., on the

HISTORY OF THE GAS METER.

Gas, as we understand the term, has undoubtedly, to a greater or less extent, existed in all ages of the world. It is, however, just about 100 years since its manufacture for useful purposes was first attempted. It has, I think, been true of all human progress that the discovery or invention of anything new has always produced a want for some other new thing. This is particularly true as regards the discovery that gas could be manufactured or utilized for commercial purposes.

The history of the difficulties encountered by those who first attempted its manufacture, how they struggled with the generating, the holding, the purifying and the conveying apparatus, are all of interest to the student of the history of gas. It is not my purpose to take up your time with a recital of these difficulties, but proceed to the consideration of the topic I was instructed to write upon by the Executive Committee of this Association, namely, "The History of the Gas Meter."

That the gas meter has a history is because that when the gas maker had found means to distribute his gas he faced the necessity of having some means of knowing how much his consumer used. This was found to be a task surrounded by great difficulties, and it was about 23 years after gas was first manufactured before the first gas meter was invented. There is some little confusion in the records as to by whom and just when the first gas meter was produced. It seems, however, that this honor may be conceded to Mr. Clegg, in the year 1815, and it was a dry meter, composed of tin cases inclosing bladders, upon which were laid weights to give the pressure when the gas was excluded from these bladders, the currents of the gas being changed by means of mercury seals. Many difficulties were experienced in trying to make this meter work, and very many articles were used to take the place of the bladders, but we have no account that they were successful, or that the meter was ever made practical.

The next attempt at a meter was the wet meter, which was first invented in 1816, but, like all new things, it was defective and did not work satisfactorily. It had some of the principles which still exist in the wet meter of to day, but was often improved, and in 1819 was substantially changed and brought to more nearly resemble the present wet meter, and first became of real service. The history of this meter seems to be the history of all inventions; first, a crude idea accomplishing the desired purpose to some extent, but very imperfect. In connection with the improvement of this meter we find the names of a number of people who have since become familiar to the student of early gas lighting, and whose works have come down to the present day, and some who are highly honored as the fathers of gas. In this connection I would mention Mr. Clegg, Mr. Malam and Mr. Crossley; and I would also note here that to the writings of Mr. Clegg, Mr. King and Mr. Richards I am largely indebted for the facts of this early history.

It is not my purpose in this paper to dwell upon the various improvements that were made in the early days of meter manufacturing, but rather to give you the main facts, so far as they can be ascertained, and, if possible, give you some thoughts that may be of practical value on the general subject of meters.

Since about the year 1820, when the wet meter had been made in such form as to be of practical value, there have been very many improvements, most of them in the direction of securing a fixed water line, some for the protection of the consumer, others for the protection of the gas maker, but in all the history of meters it is proved that the simpler the machine the better it answered its purpose, so that the original measuring wheel in its simplest form is now universally used by gas companies for measuring the amount of gas made. In the consumers' meter there is added to this a simple float and valve, so that if the water from any cause becomes lower than its proper level the flow of gas is cut off. There is this to be said of the wet meter, that so long as the measuring drum and connecting gearing are in order and the water is at its proper level, it is under usual normal conditions an accurate machine.

The first dry meter, after the attempt before mentioned, was patented in England, in 1820, by Mr. John Malam, and consisted of a tin case containing six pairs of diaphragms and a valve, which corresponds to

some extent with what is now known as the rotary valve, but instead of being of the present form was a series of tubes revolving within each other. This meter was never brought into practical use, and the gentleman who invented it met with the difficulties that had been encountered by all people who have tried to use rotary valves in connection with the working of a dry gas meter, that is, so much friction that it retarded the flow of the gas.

No other attempt seems to have been made to produce a dry meter, until the year 1833, when a man named Bogardus invented one, and if some of our friends, who of later years have undertaken the invention of gas meters, would go back into the history of the efforts of Mr. Bogardus they would discover very many of the devices that have latterly been put upon the market as meters, and their efforts, like his, will soon prove to be of no practical value.

The next attempt at a dry meter, or at least the next that seems worthy of mention, was the meter invented and patented by Mr. Defries, which was the first dry gas meter that ever came into practical use, and was what is now known as the three diaphragm, rotary valve, meter, and has been very largely in use from the time it was invented to the present day, with the exception that the slide valve is generally used instead of the rotary.

What is known as the two diaphragm meter, and which is more largely used at present, in fact has almost universally succeeded all other consumers' meters, is the one invented by Mr. Croll and Mr. Richards, and patented by them in 1844. This, like all other meters of the early days, had a rotary valve, which after a time was succeeded by the slide valve, and which is now, I believe, almost entirely used by all the best meter manufacturers.

Although I cannot, and I am sure you will not, agree with the following description as given by Mr. Clegg of this diaphragm, yet it is my firm belief that if properly made and of the right kind of material it is the best that has ever been used. Mr. Clegg says: "In this meter the measurer of the gas consists of a metal disc or piston, which alone in its passage to and fro displaces the gas and can only displace a quantity equal to the area of the disc multiplied by the distance traveled through; such distance being controlled by metal arms in connection with the valves which, when once properly adjusted, cannot vary, so that the area distance being fixed, a like quantity of gas is discharged by each backward and forward motion of the disc. The leather is so arranged as to allow the disc free play in its motion, but takes no part in the displacement of the gas."

The principle in which this gentleman expresses so much confidence is undoubtedly correct, but many of us to our sorrow have found that his confidence was to some extent misplaced, as we well know, and as some of the papers lately presented to the gas conventions apparently prove.

This, I think, gives you a very fair synopsis of the history of the meter before its introduction into this country. I have had some difficulty in getting the dates necessary for this history, and may not in all cases have them exact, but they will be found to be approximately correct. I am indebted more or less to most of the other meter manufacturers for the information here presented, but principally to Mr. W. W. Goodwin, of the Goodwin Meter Company, and Mr. W. N. Milsted, President of the American Meter Company.

Meters were first manufactured in this country by the New York and Manhattan Gas Companies, of New York City, and their manufacture was commenced in about the year 1834, and of course were all wet meters. Colton & Code commenced the manufacture of meters in Philadelphia in the year 1834. Samuel Down, in the city of New York, in 1841; Mr. Down having been previously employed by the New York Gas Company in the same branch of work, he being succeeded by the firm of Down & Merrifield. Colton & Code were succeeded by Colton, Code & Co., they by Code, Hopper & Gratz, and they by Code & Hopper. In 1863 this concern was merged with the firm of Down & Merrifield, constituting what is now known as the American Meter Company. Harris Brothers commenced the manufacture of meters in Philadelphia in the year 1849, and out of that still existing concern have sprung at least eight others, four of which still survive, namely J. J. Griffin & Co., Helme & McIlhenny, the Goodwin Meter Company and the Keystone Meter Company.

In the year 1855 the manufacture of meters was commenced in the city of Albany, N. Y., by D. & H. McDonald. They tried for a time to manufacture cast iron case wet meters as then used in Scotland, but soon found this meter was not adapted to American use. In the year 1858 was organized the firm of D. McDonald & Co., which still continues. At the time of the organization of this firm, the writer worked for them for $2 per week, and the present firm is composed of the writer and Mr. N. E. Sisson, who was at that time also one of the organizers; this making the firm of D. McDonald & Co., the oldest in the country, having continued for 36 years without change of name.

The manufacture of meters was commenced in the city of Baltimore, Md., as near as I can ascertain, some time between the years of 1863 and 1866, by Dickey, Baker & Co., this firm being succeeded by the one of Dickey, Tansley & Co., and in 1867 by the present existing concern, the Maryland Meter and Manufacturing Company. I do not know just when the manufacture of meters commenced in Boston, but I think about the year 1859, by the Tufts Brothers, which concern continued for many years, but finally, on the death of Nathaniel Tufts, divided into two concerns, known, I believe, as Nathaniel Tufts and the Tufts Brothers. These, I think, constitute all the older concerns who at present remain.

During the period from 1848 until the present time, there have been quite a number of meter houses started which have proved unsuccessful. I will not take up your time with a rehearsal of their history, as in many ways they are similar, the failure coming principally from two causes, lack of knowledge of the business; and, no doubt, some of the earlier ones from strong foreign competition.

Prior to 1864 meters were admitted to this country free of duty, and the meter manufacturers here had very great difficulty in sustaining themselves against the English competitor; but after 1864, when 40 per cent. *ad valorem* duty was placed upon them, the meter people began to prosper. At this time 3 light meters were sold at about $10 each, the price being gradually reduced, until now the prevailing price is $5.25 net for a 3 light meter, other sizes, of course, in proportion. I desire to call your attention to the fact that these prices are from 7 to 10 per cent. lower than meters are being sold in England, and also from some careful investigation I have made of late, I am satisfied that meters made in this country will average a better quality than those made in foreign lands.

There have been, during the period of which I have been speaking, many experiments tried in the way of improvements and changes in the mechanical construction of these goods, but it has been pretty thoroughly settled that what is now known as the Glover 2 diaphragm meter, with slide valves and the present simple construction of gearing, has proved the most successful.

This paper would not be complete without some mention of what is now known as the prepayment gas meter. This consists of an attachment placed upon the ordinary meter by which a certain coin can be placed in a slot and, from there passing into a receiver, the consumer can receive the amount of gas for which the coin pays. These meters have all been invented, so far as the writer knows, in England, and have been of quite a variety. Some of the meter manufacturers in this country have obtained rights to manufacture under English patents, and as the meter with this attachment seems to meet with considerable favor, there is a strong probability that they will be quite largely used in the years to come.

The writer has made considerable effort to examine the construction of these various attachments, and believes that some are fairly good and that some are entirely too complicated for the use designed. It is my opinion that in the near future some enterprising Yankee will invent a prepayment meter that will far exceed in usefulness and durability any that have yet been produced.

It is too early to speak of any practical results from the use of these meters, as none have been in use in this country until the present year, and these even are very few in number; but that there is a field for the prepayment gas meter no person familiar with the workings of the gas besiness can doubt. It is estimated that there are between 40 and 50 thousand of these meters in use in England, and while this might seem to indicate a fairly general use, yet it is true that in many of the cities they have not even tried them, their use in any quantity being confined to a few of the larger cities, Liverpool probably being the most conspicuous example, where it is said there are between 10 and 12 thousand. The advantage claimed by the gas companies there is that each of these meters is an additional customer, as they do not try to put them in use with their old consumers. So far as I know, in all cases they charge a slightly increased price for the gas, and I believe the coin used is in all cases a penny.

There are some things that will operate against the rapid introduction of these meters in this country: one is the large price it is necessary for the manufacturer to obtain for his goods, as according to the best information I can secure, the prices will have to be at least double those now charged for ordinary meters, namely, $10.50 for a 3 light meter. Owing to the complicated machinery, there is very considerable liability to get out of order, and while in some of these meters the arrangement for ad-

justing to changes of price is comparatively simple, yet, the frequent changing of the price would cause trouble, as each meter would have to be carefully adjusted to suit.

There has been, in this country, some difficulty experienced on account of the varying sizes of the coins, as you will all notice if you study the subject; the nickel and the 25-cent piece vary quite considerably in size, depending upon the different issues. There is, however, one great benefit to be derived from the use of these meters, which I think will be appreciated, and that is with consumers of doubtful ability, or willingness to pay, it does away with deposits.

I am fully aware that to many of you this has been a dry subject; I have, however, done the best I could with the time and opportunities at my disposal. As before stated, it is my wish to add a few thoughts of a practical nature.

In the issue of April 23d of the AMERICAN GAS LIGHT JOURNAL, was published a letter, which the JOURNAL stated bore the signature of Mr. Wm. A. Aldrich. I have the pleasure of an acquaintance with Mr. Aldrich and am somewhat surprised that he should have gone into print with a letter of that character. A casual reading of the letter by a person unfamiliar with the meter business would give the impression that the man had said something, and whatever impressions might be gained would be of the wrong kind. He states that in his experience, that out of every 100 old meters tested under proper conditions, 66 per cent. were found fast. I have known of several instances where 100 meters in use from one to three years have been tested without even one meter being found fast; this is unusual, but still does occur, and there are so many conditions entering into the test of meters as they are tested when removed from use, that no person can say what the average might be.

Again, Mr. Aldrich asks the question whether air or gas was used in the test, and then states that .033, the difference in specific gravity between air and gas, should be added. Does he mean that this is the difference between the gravity of coal gas and air, or the gravity of oil gas and air? I simply call your attention to the piece for the purpose of showing that the man did not really appreciate what he was writing about.

In testing old meters, the use of gas instead of air, if it made any difference, would show in favor of the gas company, for the reason that if there was any leak on the inside of the meter the gas, being of less gravity than the air, would therefore pass more rapidly through the leak, thus making the meter show slow. I contend, however, that under ordinary circumstances, the meter being tight on the inside, that a test at the same speed (not with the same outlet of course) would give very closely to the same result with either air or gas. I naturally speak from the meter manufacturers' standpoint, and after 36 years of continuous work in the meter business I find there are still many things to learn.

I cannot close this paper without expressing the opinion that between the meter manufacturer of experience and proved honesty and the manager of the gas company there ought to be the most friendly relations. There have been many improvements made in the details of meter manufacturing in the past 20 years, and very careful thought has been given to the subject, and it seems to me it would be wise for parties who are using meters, in case any question comes up regarding them, that they consult some one of experience, and that whatever matter comes into print on this subject should be the result of careful thought and long experience.

I thank you for your kind attention and trust the slight effort I have made may prove of some practical benefit.

Discussion.

The President—You have listened to a very interesting paper, and one from which we have gained a great deal of information. It will pass into our records as a valuable contribution to the history of gas meters. Does anyone wish to be heard on the subject?

Mr. Harbison—I was very greatly interested while listening to the reading of Mr. McDonald's paper, but could not help feeling some degree of disappointment when he came to the closing paragraph, because we all know Mr. McDonald's taste in the fine arts. The gas manufacturer and the meter manufacturer should be in perfect harmony and have confidence in each other; but in my opinion it is of quite as much importance that the gas consumer and the gas meter should perfectly understand each other and have entire confidence in each other—particularly the consumer in the meter. If one of us wants to buy a carriage he pays a good deal of attention to the way in which it is finished. The same is true with respect to a piece of furniture or a suit of clothes. Those who wear tall hats like to see an elegant shine on the hat. Why should not the gas meter look as well as any piece of furniture in a man's house? It is very easy to have it so; and Mr. McDonald knows it well. He, as well as other meter manufacturers, has been practicing for years in the finish of the meter, in improving the outside appearance. Years ago you would not see in a gas meter factory any meter that was not like the "imp" of the coal hole—black. If it has no sins to mourn for why should it be in perpetual mourning? It can be made, and is being made and finished by various manufacturers in such a way that it is an attraction. We have not bought a meter for certainly 15 years, and I think 20 years, that has not been finished as a piece of household furniture, painted a light chocolate color, and nicely stencilled on the outside and face. When our men go through the street on the wagon with meters in it, or with a meter under their arms, the people look on and admire it. They believe that with such a meter there can be no trouble about its measurement; that it will do its duty correctly—and it does. It will not ruin any gas company to have the meters decorated in this way. It will not cost you over two cents a year on the life of the meter to have this finish put on. Mr. Goodwin, the American Meter Company, Mr. McDonald, or any other first-class manufacturer, will be very glad to fill your orders at a cost of not over 25 cents each for decorating meters, in addition to what you are now paying; and you will get more than your money back the first year in the increased confidence which such meters command. I know this from experience. Some years ago Trinity College erected new buildings in the city of Hartford, and as the meters were arranged to sit in the hallways, they wanted them to look well. I ordered meters enough to supply the buildings, so that every section might have a meter, and had them decorated. We could not get a black meter put into anybody's house or basement after these had been seen, and we have not made the effort. When any of our meters, that were formerly black, need repairing, they are decorated when they come back from the factory. This has proved of very great value to us. Years ago I promised Mr. McDonald, at his request, that I would say nothing about it, and you will bear me evidence brethren, that I have not. (Laughter.) I go on the principle that there are no secrets in the gas business—particularly between gas managers; and this ought not to be a secret. It is no violation of confidence or breach of good faith to speak of it as I have done here and elsewhere; and as Mr. McDonald has already condoned the offense I feel justified in alluding to it here. I think that is the only omission he has made in his statement—that it does not call attention to the importance of decorating meters; because it is of real practical value in the degree of confidence which it gives the consumer in his possession of a first class article. It will not make so much difference about the internal arrangements of a meter; we know that they are all right, and of course we believe what the meter says, and we expect to be believed when we make statements; but I am sure that decorated meters will prove an advantage to every company that introduces them.

Mr. McDonald—I want to say a word before this subject is passed. I have, as you know, given quite a number of dates in this paper, and I realize that some of them may be wrong. Therefore if those who are interested in having the dates exactly correct will let me know of any errors before the paper finally goes into the archives, I will see that the corrections are made.

Mr. Somerville—I am sorry there is not a little more debate upon this interesting paper. Mr. McDonald mentions a new subject that has come before the Association. I refer to the prepayment meter. I was in hopes we would have some debate upon this, to us, new idea. I would like to hear what the members have to say about this thing, whether they consider that prepayment meters would be good things for their districts, if they are intending to put them in, and what the prospects are. I have an idea that in some places prepayment meters would be an excellent thing. It seems a good thing to me that a man can purchase his gas as he purchases his oil; so that if he wants 25 cents worth of gas he puts 25 cents in the slot, and gets his gas. Surely this is a new idea, and I was in hopes we would hear something about it. I hope Mr. Chollar will tell us about this Yankee invention that Mr. McDonald hinted at. We were talking over the thing—I had an idea and he had an idea—and I would like Mr. Chollar to describe this invention of his. He says that it is unpatented; but he is a philanthropist, as we all know, and I trust he will let us hear about it.

Mr. Chollar—I spoke with Mr. Somerville and two or three other gentlemen yesterday about a little contrivance that we are attaching to one or two gas meters for the purpose of finding out something about unexplained gas bills. It is a little electrical attachment to the meter, connected with a recording apparatus—a clockwork arrangement, whereby every 5 feet of gas that is registered on the meter pricks a little hole in a paper—the paper being moved by clockwork so as to leave a

record not only of the amount of gas consumed, but also of just when it was consumed. It is intended to explain not only leakages, but to betray a lot of little secrets that the gas consumer does not know anything about. We have just completed a couple of the devices, but have not yet put them in practical operation. It has occurred to me that the same or a similar arrangement might be applied to the slot meter by means of an electrical attachment, so that dropping a nickel in a slot upstairs would start the meter in the cellar.

On motion of Mr. Odiorne a vote of thanks was tendered to Mr. McDonald for his interesting and valuable contribution to the history of gas meters.

The President—The next paper is that by Mr. Irvin Butterworth, on

STREET MAIN PRESSURE.

The conditions constituting a proper distribution of gas in respect to street main pressure have long been well recognized and understood. They demand, simply and briefly, the maintenance, within reasonable limits of fluctuation, of a constant and moderate pressure, night and day, in the house pipes of every consumer.

The means by which these conditions may be fulfilled are also well known. They consist of proper location of works with reference to territory supplied, large street mains, special "feed" mains to low and remote districts, district holders, station and district governors, pressure regulators at consumers' meters, governor burners, etc. There are no insurmountable mechanical or physical difficulties in the way of securing a proper distribution of gas under practically any conditions of location or topography.

But, notwithstanding the end sought to be attained, and the means thereto, are so well understood, it is, I fear, nevertheless, unfortunately the fact that the distribution of gas in most cities is accomplished in a more or less crude and imperfect manner. Of course, absolute nicety and perfection of pressure conditions are unnecessary, even if they were possible, which they are not; but, as above stated, a moderate and practically uniform pressure, throughout all hours of the day and night, and in the entire city or district supplied, is not only desirable, but possible. Just whether any particular company is warranted, from economic considerations, in incurring the expense necessary to secure this result, or how much money they should expend in approximating it, is a matter depending, like so many others in our industry, upon local conditions. Each gas company should study its own distribution conditions thoroughly, take a broad view of the subject, and do whatever is for its own best interests "in the long run," remembering that they are not in business for one year or ten years, and that when their output shall have outgrown their distribution system they cannot remove to another city. But it seems to me that the importance of the subject of street main pressure is not as well recognized as it should be. It appears to have been laid on the shelf. As far as I can find, no special treatment has been accorded it in the gas journals or gas association meetings for a great many years. It has occasionally been mentioned incidentally in connection with the subject of unaccounted for gas, but it seems to have been assumed that nothing further can be added, or needs to be added, to the present stock of knowledge concerning it. The result of this, in my opinion, is that its importance is apt to be forgotten and the whole subject neglected, both in theory and in practice. It is to call attention to this danger and emphasize the importance of the subject, rather than to add anything new or valuable to what is already known thereon, that this paper has been written.

It must be remembered that conditions respecting street main pressure have undergone some changes in recent years: (1). The increasing use of gas for fuel necessitates a higher pressure, especially in the day time, than formerly; (2) the necessity for effecting all possible economies in order to meet increasing competition and the demand for a lower selling price, has greatly increased during the past decade; and (3) crudities and imperfections in distribution that were tolerated by consumers with equanimity in the early days of gas lighting and even comparatively recently, now irritate and fail to satisfy them, as they become more and more accustomed to the luxuries, comforts and mechanical refinements and perfections of modern civilization. Therefore, it seems to me that we might profitably give a few moments' special attention to this subject, as old as the gas business itself, in the light of these new developments.

Bad conditions as to street main pressure injure a gas company in two ways: First, directly, without the knowledge of the consumers, by increasing the company's actual leakage; and, second, indirectly, by causing the consumers inconvenience and dissatisfaction, and thereby diminishing the use of gas. In my judgment the latter source of injury is much more important than the former.

The fact that high street main pressure increases leakage needs neither mentioning nor demonstration; it is well known and self evident. But it is the actual and not the percentage of leakage that is increased by high street main pressure. Experiment and calculation have shown that the escape of gas through an orifice, and therefore the amount of actual leakage, is in proportion to the square root of the pressure. Suppose now a gas company that sells 200,000,000 feet per year at $1.25 per thousand, and whose actual leakage is 20,000,000 feet per year, at an average street main pressure of fifteen-tenths, should, in order to supply gas stoves satisfactorily, on account of small street mains, increase their average pressure to twenty tenths. Their actual leakage would increase in the ratio of 3.87: 4.47 (the square roots of 15 and 20 respectively), and the increase would amount to 3,101,000 feet annually. If their gas costs 60 cents in the holder, this increased leakage would mean a loss of $1,860 per year, or 6 per cent. interest on $31,000. In other words, if their consumption would not also be increased by the increased pressure they could better afford to invest $31,000 in larger mains than to increase their pressure this half inch. As their consumption would be increased, however, let us see how much the increase must be in order to wipe out this loss. Assuming that the cost of distributing this extra gas sold is one half its cost in the holder, the total cost per 1,000 feet sold would be 90 cents, leaving 35 cents net profit per 1,000 feet. Dividing the annual increased loss through leakage, $1,860, by this profit per 1,000, gives 5,316,000 feet as the increased sales necessary to be obtained annually in order that the company might barely come out even in their experiment. As a matter of fact, however, if the consumers would all leave their burner keys open as wide as they were before the pressure was increased, and make no change in their burners, I think I am correct in saying that the consumption, or sales, would increase in exactly the same ratio as would the leakage; for, notwithstanding the effect of the increased pressure upon the leakage is exerted throughout all hours of the 24, whereas, the consumption of gas would get the benefit of it during only the four hours, say, in which the great bulk of it occurs, yet, if the quantity passing the burners at $1\frac{4}{8}$ths pressure during a certain number of hours each day should aggregate a certain quantity for the year, then increasing the pressure to $2\frac{2}{8}$ths and leaving all other conditions unchanged would certainly result in increasing the consumption in the ratio of the square roots of these two pressures, just as the leakage increased. In the supposed case the sales would increase 31,007,750 feet per year, or 10 feet for every 1 foot increased leakage; and for every 60 cents that the company would lose through increased leakage it would make $3.50 (10x35 cents) through increased sales. This is under the supposition, as above stated, that consumers would not change their burners or the adjustment of their burner keys; but, as a matter of fact, it is hardly possible that a gas company who are giving a majority of their consumers adequate service at an average street main pressure of $1\frac{4}{8}$ths could increase it to $2\frac{2}{8}$ths without obliging a very large proportion of them to reduce the openings of supply to their burners, so that, in those cases, no more gas would pass than formerly. It is safe, I think, to estimate that the sales would not increase more than 5 feet where the leakage would increase 1 foot, which would mean a gain of $1.75 for the loss of each 60 cents. But I assumed above that the expense of distributing this increased sales would be the same per 1,000 feet as that of the previous sales, which, however, would not be the case. There would be no additional meters, meter readings, nor book accounts, and, in fact, no items of increased distribution cost whatever. Therefore, the cost of this extra gas sold should be figured the same as that in the holder, and hence the profit would be 65 cents per 1,000 feet, instead of 35 cents; or for every 60 cents lost through leakage the company would gain $3.25 through increased sales, or a net gain of $2.65 for every 1,000 feet lost through the increased pressure. There would be 3,101,000 feet so lost, and multiplying this by $2.65 gives $8,217 as the net increase in the revenues of the company for the year, due to increasing their average street main pressure from $1\frac{4}{8}$ths to $2\frac{2}{8}$ths, provided I have made no error of calculation or assumption, and overlooked no factor entering into the problem.

This, is, of course, an extreme case, but it will serve as an illustration of how each gas manager may, for his own information and guidance, figure the problem for himself, based on his own conditions. He will be convinced, I think, that the immediate and direct effect of increase of pressure, up to a point where consumers would check the flow of gas through their burners, would be to augment the revenues of his company. Beyond this point, of course, it would decrease them, since leakage would continue to increase while sales would remain stationary.

I do not want to be misunderstood as believing that a gas company should carry the maximum pressure consistent with a satisfactory delivery of gas at the consumers' burners; on the contrary, gas should be dis-

tributed at the lowest possible pressure compatible with good delivery. I have always assumed that gas companies carrying the highest street main pressures would have the largest percentage of unaccounted-for-gas, and conversely, that a sure way to help keep down your percentage of unaccounted for gas was to carry low pressures. This would be true if very high pressures were carried; but from reports which I have received from 120 gas companies (to whom I now desire publicly to express my thanks), I am forced to the conclusion that, within the limits of pressures carried in modern practice, street main pressure does not bear any relation to unaccounted-for gas in terms of percentage of gas made, or if so, the effect of the pressure is neutralized and overcome by other influences. From reports sent me I have compiled the two tables given herewith.

Twenty Gas Companies Having the Lowest Percentage of Leakage.

Reference No. of Gas Comp'y.	Process of Manufacture.	Population, in Thousands.	Annual Output in Millions.	Works Pressures. Max.—Night. Winter.	Max.—Night. Summer	Day. Winter.	Day. Summer	Percentage of Leakage.	Leakage per Mile of Main per Year.
1	C. & W.	18	44	47	37	18	18	6	100,000
2	Coal.	50	60	22	20	10	10	6.27	149,900
3	C. & W.	250	575	35	30	17	17	4	142,000
4	Water.	25	28	19	19	14	14	5.08	112,200
5	"	43	65	21	21	21	21	4.81	94,437
6	"	25	55	22	22	22	22	5.3	.....
7	C. & W.	185	325	28	28	18	18	4.95	.....
8	"	300	900	30	30	20	20	5.5	.....
9	Coal.	50	90	35	35	25	25	5	75,000
10	"	20	28	20	18	15	12	6	45,828
11	C. & W.	90	143	30	30	20	20	5 65	168,286
12	Coal.	26	40	26	26	26	26	5 4	109,290
13	C. & W.	182	330	20	18	10	10	6.25	132,200
14	Coal.	300	600	20	15	12	12	5	200,000
15	Water.	74	57	30	25	20	20	6 5	150,000
16	Coal.	80	254	25	23	18	18	5.1	162,900
17	C. & W.	15	25	20	20	20	20	5	.....
18	Coal.	25	33	25	20	15	15	2	.....
19	C. & W.	45	100	32.5	25	25	25	6.58	166,150
20	Water.	206	300	25	25	25	25	6 6	.....
7 C., 8 C. W., 5 W. Average.		100.5	202.6	26.12	24.35	18.55	18.40	5 36	*129,142

* Average of 14.

Twenty Gas Companies Having the Highest Percentage of Leakage.

Reference No. of Gas Comp'y.	Process of Manufacture.	Population, in Thousands.	Annual Output in Millions.	Works Pressures. Max.—Night. Winter.	Max.—Night. Summer	Day. Winter.	Day. Summer	Percentage of Leakage.	Leakage per Mile of Main per Year.
1	Coal.	38	53	15	15	15	18	14	303,000
2	"	40	146	26	26	16	16	15	400,000
3	"	75	65	24	24	15	15	15	416,000
4	"	57	70	22	22	15	15	13	248,623
5	"	15	17	18	15	12	10	17	209,592
6	"	40	34	22	15	22	15	20	300,000
7	"	11	16	32	20	25	20	16.5	239,000
8	C. & W.	35	35	22	18	22	22	14	300,000
9	Coal.	23	25	25	25	15	18	19.5	.....
10	C. & W.	120	300	28	24	16	16	14.2	.....
11	Water.	46	70	28	26	18	18	19	415,000
12	Coal.	60	92	24	22	11	11	14	269,000
13	C. & W.	150	275	24	20	17	15	18	385,000
14	Coal.	17	50	22	22	15	15	18.2	244,660
15	"	285	530	30	30	25	25	19	.....
16	"	50	70	40	40	10	10	20	.....
17	C. & W.	40	50	22	20	12	10	23.5	343,000
18	"	1,200	3,391	36	36	25	25	14.6	572,218
19	"	42	55	32	32	14	14	15	.....
20	Coal.	60	44	29	29	23	23	13.3	94,149
13 C., 6 C.W., 1 W. Average.		*63	108	26.05	24.55	17.15	16.55	16 64	*315,950

* Average of 19. * Average of 15.

Totals and Averages.

Twenty Companies Having	Process. C.	C. & W.	W.	Population, in Thousands.	Annual Output in Millions.	Works Pressures. Max.—Night. Winter	Max.—Night. Sum'er	Day. Winter	Day. Sum'er	Average Pressure.	Percentage of Leakage.	Leakage per Mile of Main.
Low leakage.	7	8	5	100.5	202.6	26.12	24.35	18.55	18.40	21.85	5.36	129,142
High leakage.	13	6	1	63	108	26.05	24.55	17.15	16.55	21.07	16.64	315,950

It will be seen that the street main pressures (at the works) of the 20 companies having the lowest percentage of leakage average a little higher than those of the 20 companies having the highest percentage of leakage. As the pressures average about the same for both, however, it is evident that there is no apparent relation between percentage of unaccounted for gas and street main pressure, and that the difference in these percentages must be accounted for by other circumstances.

It will be noticed that the cities and output average much the largest in the case of the 20 companies having the lowest percentage of leakage. This doubtless accounts for a great deal of the difference. It is manifest that street main pressure bears a direct relation to the actual leakage per mile of main; but since in ascertaining the above leakages per mile of main no account was taken of the size of the mains in any instance, this gives the largest companies much the advantage in the above comparison. If the mains had been reduced to a certain fixed size, say 3 inches, before making the calculation, the leakage per mile of main of the large companies would not be relatively so small. Again, it must be remembered that in large and compact cities, with consumers close together, the percentage of leakage should not be so high as in the smaller cities, with scattered consumers and a low ratio of output to main mileage.

I admit the possibility, however, that it may not necessarily follow that because the average pressure at the works is about the same in both the large and the small cities, the street main pressure throughout the cities themselves is therefore the same in both sets of cities. In fact, it is probable that the average street main pressure throughout the smaller cities is higher than in the larger cities; but I doubt whether there is a material difference.

I have also noted the different processes of manufacture, and ascertained that of the 20 companies having the highest percentage of leakage, 13 of them make coal gas exclusively and only 1 water gas exclusively; whereas, in the case of the 20 companies having the lowest percentage of leakage, only 7 make coal gas exclusively, while 5 manufacture all water gas. This may or may not indicate that there is less condensation of water gas than of coal gas. The greater gravity of the former would hardly reduce its percentage of actual leakage.

Of the 40 companies, 16 mentioned the material used by them for making joints. Eight of these 16 companies were "low leakage" and 8 "high leakage." Of the former, 4 use lead joints and 4 cement joints exclusively; of the latter, 6 employ lead joints and 2 cement joints, exclusively, This may possibly mean a slight advantage in favor of cement joints.

It is apparent, however, that the percentage of unaccounted-for gas is the net or aggregate result of very many influences and circumstances, and that street main pressure is not dominant among them. There are so many conditions and factors entering into the question that it furnishes a most interesting and complex study in the relation between cause and effect. It is hard to say "Lo here" or "Lo there" in assigning causes for leakage. For instance, in reports from 14 companies having a *low* leakage the following causes therefor were assigned the number of times indicated:

Frequent barring over mains for leaks	8
Deeply laid mains	7
Good soil	5
Low street main pressure	4
Well laid mains	4
Correct station meter	3
Frequent testing of consumers' meters	4
Thorough condensation	3
Large mains	3
Level territory	3
New mains	2
Good street main governor	2
Mains and services steam-tested before laid	1
Services "pitched"	1
Governor burners on street lamps	1
Careful attention to time of lighting and extinguishing street lamps	2
Well fixed water gas	1
Sold at higher temperature than at station meter	1
New meters	1
Output large per capita	1

Small mains (6 inches and under) wrought iron	1
Sewer work watched	1
Mains laid in soil full of water	1
New services	1
New sewers	1
Mains on each side of street	1

Total number of causes mentioned, 26.

In reports from 14 companies having *high* leakage the following causes therefor were assigned the number of times indicated :

Scattered consumers	6
High pressure on account of gas stoves, etc	5
Small mains	5
Bad mains	4
Hilly territory	3
Bad service pipes	3
Bad soil	2
Sewer building	2
Shallow mains	2
High pressure to fill district holders	2
Concrete pavements, preventing detection of leaks	1
Electrolysis	1
No district governors	1
"Dead-head" consumers	1
The laying of street pavements	1

Total number of causes mentioned, 15.

It is noteworthy that in the reports from the 14 "high leakage" companies, high street main pressure or small mains (which are synonymous) are mentioned 12 times as a cause thereof ; while in the reports from the 14 "low leakage" companies, low street main pressure and large mains (which are also synonymous) are mentioned 7 times as being entitled to the credit, in part at least. No other one cause is mentioned so often, showing that, after all, street main pressure is an important factor in the matter of unaccounted-for gas, notwithstanding one manager stoutly maintains that although he has had to increase his street main pressure considerably, on account of his gas stoves, yet he cannot observe any increase whatever in his leakage. Perhaps, though, he means his percentage of leakage. His actual leakage must needs have increased. For whatever may be said as to the former, there can be no question that there is a definite relation between actual leakage, in feet, and street main pressure. The actual quantity of gas lost will, as before stated, increase or decrease as the square root of the pressure. It follows, therefore, that everything else being equal, the companies carrying the lowest pressure will suffer the least from actual leakage ; and that at any given pressure, the companies having the tightest mains and services will lose the least from this source. The incentive still remains with us, therefore, to make our mains large and tight. But I think the facts show that up to a point where the consumers will check the flow of gas through their burners (which point, it must be borne in mind, is very soon reached), an increased pressure in itself does not decrease the immediate revenues of the company, no matter what the condition and size of their street mains and services may be.

It is, therefore, to the second branch of our subject—the indirect or reactive effect, upon the company's business, of the pressures it maintains —that we must turn to determine what that pressure should be. I have already given my opinion that it should be the minimum pressure compatible with a proper delivery at the consumers' burners. What this pressure is, is a matter of opinion largely and of local conditions. Gas engineers in this country differ among themselves in their views upon what constitutes a proper pressure in the house pipes ; while all of them, I believe, favor higher pressure than do their European brethren. An English authority states that "the pressure most suitable for ordinary uses of lighting and heating is about $\frac{5}{10}$ths of an inch." If this refers to pressure at the meter, it would be too low by about one-half, I think, to suit American conditions and opinions.

Probably $\frac{1}{1}\frac{5}{0}$ths at the meter would be considered by the greatest number to be a proper pressure. Assuming this to be the case, the effect of great variation, either up or down, from this pressure, is very injurious to the gas company. I do not mean simply an irregular pressure, but a uniformly high or a uniformly low pressure as well.

Probably no gas company is guilty of the shortsightedness of maintaining pressures lower than their consumers want or need, but in every city there are some low or remote points that are liable to be inadequately supplied. If so, the pressure at these points should be immediately reinforced. No concern can hope to retain their business who are unable to fill their orders. Consumers want more light now-a-days than formerly, and if the gas pressure is insufficient they are driven to other means of lighting.

But the tendency and temptation are toward the other extreme of high pressure. This causes excessive gas bills, dissatisfied consumers, "blowing" gas burners, and in general an object lesson in gas lighting that greatly discredits its efficiency and economy.

Varying and irregular pressures are not only the worst, but unfortunately the commonest of distribution evils. Flames that flicker and are too small during the early hours of the evening and that "blow" at 10 o'clock do the gas company and its business incalculable damage. I have heard of gas jets in a sitting room that had to be adjusted and readjusted at least four times during a single evening to take up variations in pressure. Under an increase of pressure from 1 to 2 inches, the flame from an ordinary lava tip increases nearly 50 per cent. in size, and on many a social occasion has the sudden cracking of a gas globe, due to increasing pressure as the evening advances, startled the guests, while the hostess, annoyed and mortified, apologizes, and the host, condemning the gas and the gas company in terms more or less emphatic, rises and turns the gas key, all eyes watching him meanwhile, the conversation during the interruption doubtless turning upon the superiority of electric light, or the latest gas meter story is related. The guests may possibly never think of the occurrence again ; but it has left an indelible impression upon their minds nevertheless, and if I did not have complete confidence in the enduring vitality of gas lighting I would be tempted to say that the episode was "another nail in its coffin."

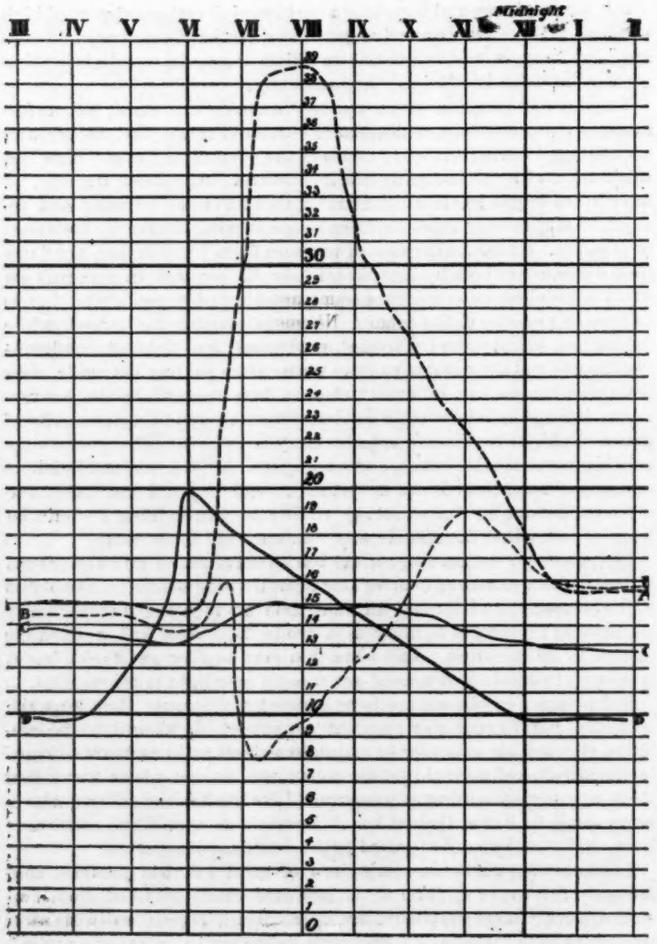
The consumer notices and suffers the inconvenience and annoyance of insufficient, excessive or irregular pressure long before he complains to the company, and during all that time he is being unconsciously educated to regard gas lighting as a crude, imperfect and unscientific method of illumination. This education may be slow and slight, but it is enough to decide him against gas when a new light is offered him.

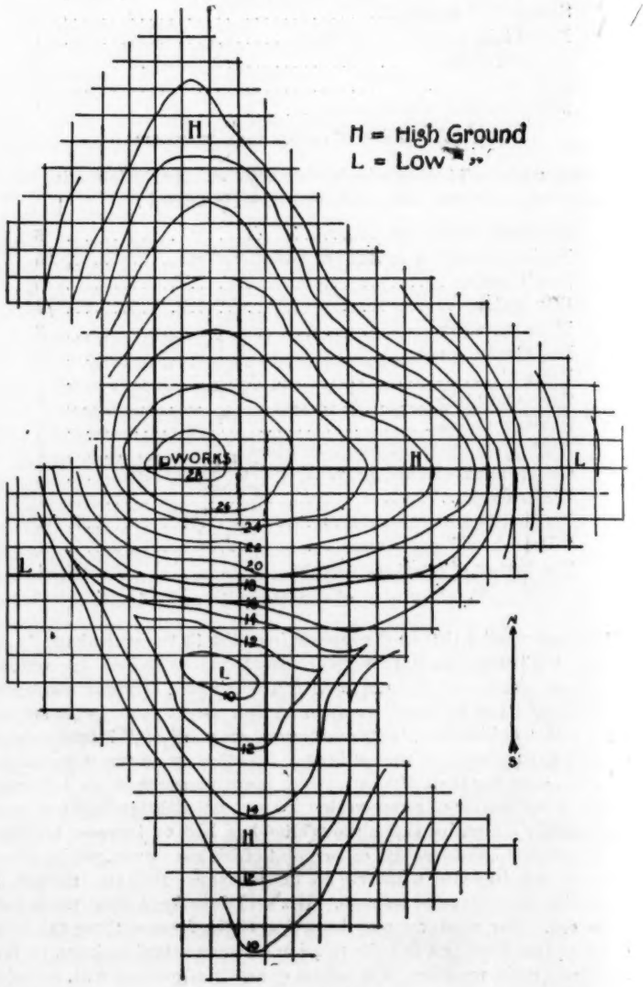
Bad pressure conditions are to be avoided, not because they hurt the company, but because they hurt the consumer. It should be the ambition of every gas manager to maintain a street main pressure so regular, moderate and correct that his consumers should never know that there was any such thing as pressure. Like the healthy laborer who is never made to know that he has a stomach, so should gas consumers never have their attention called to the existence of pressure.

The following chart is a comparison of good and bad pressure conditions. It is made up from actual pressure sheets obtained from two comparatively large gas companies, operating under practically the same conditions as to location of works with reference to territory supplied, business character of population, topographical conditions, etc. (See following page.)

The dotted lines A B represent pressure in city No. 1, and the solid lines C D in city No. 2. The heavy lines show pressures at the outlets of the station governors, the light lines represent pressures taken simultaneously in each case with those indicated by the heavy lines at points remote from the works and where the pressure was weakest at the time of maximum consumption. It will be seen that in city No. 1 a pressure of $\frac{3}{1}\frac{3}{0}$ths at the works was necessary to prevent the pressure from dropping below $\frac{8}{1}\frac{8}{0}$ths at a point remote therefrom, making a range of $\frac{7}{1}\frac{5}{0}$ths; while in city No. 2 only $\frac{7}{1}\frac{8}{0}$ths pressure at the works was necessary to hold the lowest pressure at a remote point, at the time of maximum consumption, up to $\frac{1}{1}\frac{3}{0}$ths, a range of only $\frac{7}{1}\frac{5}{0}$ths. It should further be said that the pressures shown for city No. 1 were taken in April, while those of city No. 2 were taken in February, when, on account of larger consumption, the difference between maximum and minimum pressures would naturally be greater than in April. City No. 2 is therefore at some disadvantage in this comparison. The pressure conditions in city No. 2 are, however, almost ideal. A consumer, in whatever part of the city he might be, would notice no fluctuation whatever in his lights, which would burn at their maximum efficiency at all times. On the other hand, in city No. 1 the pressure conditions are bad. A consumer near the works would have "blowing" burners at the same moment when the suburban resident would himself be "blowing" the company up for not putting on more pressure! The only difference in the conditions having a bearing on this comparison is that the gas mains in city No. 1 are small, while those in city No. 2 are large. I might say, incidentally, that in city No. 1 the unaccounted for gas is 11 per cent. of the make, while in city No. 2 it is only 5 per cent., showing, I think, that the mains in city No. 1 are not only too small but not very tight.

As conditions affecting street main pressure are not alike in scarcely any two cities, no general or hard-and-fast rule can be laid down as to how proper pressures may be maintained. Each company must study its own conditions and necessities in this matter and apply the remedies necessary in its own case. Pressures should be carefully taken, by





means of recording gauges throughout the distribution system, under the same volume of consumption, and a chart constructed showing lines of equal pressure throughout the city at the time of evening when the rate of consumption is greatest. This will disclose, in a very graphic manner, the weak points needing attention. Such a chart is illustrated above:

This chart would indicate that the city has small and insufficient street mains and is built upon very uneven ground. The difficulties to be overcome would be greater than usual. If the street mains were exactly proportioned throughout to the consumption and the city were on level ground, an automatic street main pressure governor at the works would solve the problem to an absolute nicety. But in this case it is evident that such a governor, while just as indispensable as in any, could hardly maintain proper pressure conditions. It would be necessary to enlarge the mains, run special "feeders" to the low and remote districts, so that lower pressures could be carried at the works, and cross connect them into the lateral mains when the low or remote territory is reached; district governors might be placed to advantage on mains supplying the high points, and in extreme cases pressure regulators at the consumers' meters or governor burners could be used. The use of district holders as a means of equalizing pressures is condemned by some engineers.

A desideratum in the distribution of gas is a good automatic pressure governor that can be placed under the street on a line of lateral distributing main leading from a special "feeder" containing gas at high pressure. Another desideratum is a cheap and efficient pressure regulator to place at consumers' meters, those now on the market being expensive and liable to derangement. And still another is a cheap and efficient governor burner, that will not clog with dirt and require attention. But with such means and appliances as are now available every city can be supplied with gas under proper pressures throughout and during all hours of the 24. Will it not repay every company to incur the expense necessary to do this?

Discussion.

The President—The paper just read was most interesting indeed, and the subject is now before you for discussion.

Mr. Thompson—I notice that, on page 15, Mr. Butterworth remarks, "The use of district holders as a means of equalizing pressures is condemned by some engineers." I would like to ask the reason for the condemnation.

Mr. Butterworth—I am under the impression that the engineers who condemned the use of district holders did so because as the holders were connected with the mains of the distribution system they were obliged to maintain a high pressure; and one man objected to having the holders scattered, claiming that the holders ought all to be near the works so as to be under the eye of the engineer.

Mr. Russell—In connection with this question it has been suggested that engineers in laying gas mains attempt to connect their pipes up to existing sizes, and continue them on at the same size, notwithstanding they have an increased consumption on that line, and will have further to distribute, while other conditions remain practically the same. The excuse has been brought forward that anything of that sort requires a great deal of computation, and that the conditions are not favorable to their getting things just right. Mr. Cox has gotten up an apparatus which I have been asked to show to the Association. He has not been able himself to attend and explain it. It is a very handy thing. Of course some corrections will have to be made, because there is no allowance made for difference in elevations. All its computations are very readily ascertained. I have the instrument here. I think most of us are acquainted with it, as it was described in the last issue of the AMERICAN GAS LIGHT JOURNAL.* While I do not make any point on the thing particularly, I thought some of you would probably like to have a look at it and be able to get over some of your troubles in that way.

The President—If Mr. Russell will leave this instrument on the table

*See JOURNAL, May 14, 1894, page 690.

each one who desires to look at it will have an opportunity to examine it after the adjournment. Has any gentleman anything further to offer on this subject? If not we will pass to the next subject—after thanking Mr. Butterworth on behalf of the Association for his valuable paper.

[To be concluded.]

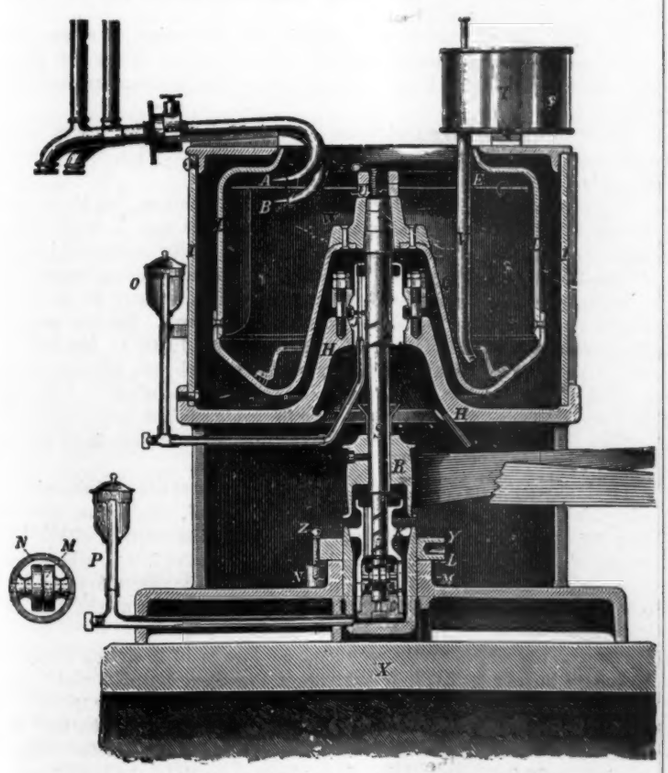
The Separation of Water from Tar.

[A paper read by Mr. Theodor Petersen, of Copenhagen, before the North of England Gas Managers' Association.]

It will be generally known that in tar, as ordinarily stored in tar wells, there is 16 per cent., and in some cases even more, contained water. This fact is, of course, well known to the tar distillers; and, therefore, when making offers for tar, or when making contracts with gas works, they bear this in mind, and bid a lower price than they otherwise would if the tar were perfectly free from this water or ammoniacal liquor.

The water has to be partially removed to make the tar of commercial value either to local consumers or to the large distillers. The old cumbrous method of gravitation will, if enough time be allowed, and if the green tar is agitated from time to time, take the water to the top; so that the tar can be drawn off from the bottom with less water than ordinarily in it. But even under the most favorable conditions the contained water is rarely less than 7 or 8 per cent. When this green tar arrives at the distillers' works it is placed in tanks and warmed, so as to diminish the viscosity; and then it is again agitated, and left for a short time. In this way the contained water is reduced to 3½ per cent., but very rarely indeed is it less in quantity than this.

By a mechanical process—the patent of Burmerster and Wain, of



Copenhagen—it is now possible, at very small cost, to reduce the water to less than 1 per cent., and this quantity is really chemically-bound moisture, impossible of elimination, except by distilling. Every vestige of mechanically bound water is removed almost instantaneously by this method, which has the additional advantage of being so simple that one's only feeling is surprise that nobody has thought of trying it before. It has now been in operation in Copenhagen and in Berlin for the past four years, with (I gather from inquiries) the most pre-eminently satisfactory results; and I take special pleasure in bringing the arrangement before your notice to-day.

I need not go into great detail as to the mechanical construction of the machine. You will observe from the drawing that the operation is performed by a centrifugal machine exactly similar in principle to those which are employed in sugar factories, chemical works, and in steam dairies for the separation of cream from milk. The tar is first warmed (in warm weather this is not necessary) to a temperature of about 92° F., and is then run into the machine through the tube V. The drum D is revolving at a speed of 2,000 revolutions per minute; so the green tar impinging against the bottom ring, just in front of the opening of the tube, is split up by reason of the difference in the specific gravities of tar and ammoniacal liquor. The tar being the heavier is forced downwards and outwards, and takes up a vertical position nearest the periphery of the drum. The ammoniacal liquor takes a vertical position inside of this, nearest the centre of the drum. By a very simple and yet ingenious device, the tar and liquor are then drawn off through different tubes A B. You will notice on the drawing a plate (C), near the top of the drum. This has an opening left nearly all round the periphery, and the tar forces its way through this and on to the top of the plate, whence it is drawn off by the tube A, shown above the plate. The ammoniacal liquor, at the same time, is drawn off by the fixed tube B, shown below the plate. No suction pumps are required, the tar and the liquor forcing themselves through the tubes by reason of the great peripheral velocity. The screws shown on the drawing (and, as you can also see, on the small model I have before me) are for regulating the distance of the tar tube from the wall of the drum. When the drum has to be quite emptied before stopping, this tube is screwed outwards till it nearly touches the walls, and it thus empties the drum down to the last drop.

Very little mechanical skill is required, and an ordinary laborer will learn to work the machine perfectly in four days. Its construction is simple and strong, and not at all liable to get out of repair. The experience in Copenhagen has been that, in four years, less than 1 per cent. (during the four years) has been spent in repairs. The mouths of the tubes wear out slowly, but as they are made to screw on and off, there is no difficulty, and no waste of time incurred in changing the points.

The "spun" tar is not only free from water, but also, in a way, purified. All grit, dirt particles, and the heavy pitch adhere to the walls of the drum; and the machine is therefore stopped three times a day to be cleaned out. This is effected quickly by means of specially-shaped scrapers, which clear the whole drum in less than half an hour. The pitch and refuse so obtained are placed on one side, until sufficient is collected, and then either mixed with small coke and burned under the gas works boilers, or else it is mixed with ashes and sold to make cheap paths.

By extracting the water, the tar is, naturally, made much more valuable for the distiller, for much time and expense are saved him in getting his tar down from about 8 to 3½ per cent. of water; also the difference between the 3½ and the 1 per cent. (which is the result obtained by this method). Although this difference does not sound much, it means a great deal, and a large saving to him in time and coal during the operation of distilling. You must also bear in mind that this machine does the whole operation—from 16 per cent. or more water down to 1 per cent.—in one treatment. The tar is ready for the market at once. With the old fashioned method, it is on hand a long time, and has to be agitated and treated several times. This small machine does in a few minutes what is not so thoroughly accomplished by the old method in months.

Again, with the tar free from water, there are none of the sudden upheavals that sometimes occur when a small pocket of water is suddenly converted into steam in the still, and forces its way through the mass of tar, and sometimes causes it to start boiling over. This danger is entirely got rid of by using only "spun" tar in the stills.

In addition to this there is the other point I must consider, now that so many of us are using or contemplate using tar for carbonizing and burning purposes. With the tar absolutely free from water, the effects when carbonizing it are much more satisfactory; and the fullest calorific effects are obtained from the combustion. In this way, therefore, the process would prove, in my opinion, a saving. In the case of oil gas tar, which is now sometimes burned with as much as 19 per cent. of water in it, it most certainly would show a great saving.

I mentioned a few minutes ago that the tar required warming during cold weather before passing into the machine. The apparatus for this purpose is very rough and very cheap—consisting of a tank 6 feet long by 6 feet high by 3 feet wide, containing an iron coil, through which exhaust or other available steam passes. The coil need only be built up roughly of iron tube, as it does not matter in the least if water condenses and leaks into the tar, as the machine promptly takes it out again.

These processes, as you are all aware, are sometimes very pretty theoretically, but practically do not serve their purpose, as they cost more

than they save. This, however, is not the case, I think, you will find in this instance. I have before me a balance sheet comparing the cost of a day's working (in connection with the tar) of the old system of gravitation and the new system of mechanical separation. The figures do not include any estimations, but are from actual working experience at the East Gas Works of Copenhagen; and the balance sheet proves very conclusively that this system is commercially, as well as mechanically, a great improvement on the old. I notice in the first place that the power required is very small—viz., 4-brake horse power; and, according to the Copenhagen practice, the sulphate of ammonia obtained from the liquor saved more than pays for the cost of operating the machine, including high charges for interest, depreciation, and repairs. The figures given for labor would not, of course, apply for England, as their labor is cheaper than ours. But this does not affect the final result, as the labor is the same for the old and the new style.

The Copenhagen practice is the same, practically, as the average English; and this would naturally be the case, as they employ the same plant, the same methods, and they also import Newcastle coal for making their gas. They usually get about 10½ gallons of tar per ton of coal carbonized; and the sulphate of ammonia works out at about 22½ lbs. per 30 gallons of liquor (or 22½ lbs. of sulphate per ton of coal carbonized). The prices they obtain are, of course, slightly different; but the proportion (when comparing with expenses) is again about the same. They obtain, on an average, 11 "ore" per lb. of sulphate (8 ore=2 cents); and their expenses for extracting the sulphate from the liquor are 6 ore, exactly 1½ cents per lb. The figures given in the balance sheet clearly show that if they only obtained their profit from the extra sulphate saved, and they sold their "spun" tar at the same price as green tar, they would only save about 75 cents per day, including all charges for working, interest, etc. As, however, they obtain a higher price for their "spun" tar (the exact figure is 16½ per cent. higher), they find that, on such a small amount as 2,800 gallons of green tar, they save $6.45, which, you will agree with me, is a very satisfactory result. Not only do the gas companies profit by it, but the distillers also save by using the "spun" tar. They cheerfully pay 16 per cent more for it; for they find that, even so, they save 12 per cent. when comparing it with the old quality of green tar. I have no data to substantiate this last figure; but I am informed that this is a fact.

Since the foreign gas works have adopted this method, they have never found any difficulty in disposing of their tar. We all have experienced, at various times, some difficulty in disposing of our tar at a remunerative figure; and so in former times did these foreign gas works. Now, however, the "spun" tar seems to sell itself; and they readily obtain the higher price. In the summer they are not able to keep pace with the demand.

Well, gentlemen, I think I have told you sufficient to make you think this new system is well worth consideration and looking into. If, where the other conditions are so very similar as here and in Copenhagen, this process can show a saving—which, on the old principle of "a penny saved is a penny earned," I may safely call *money earned*—of $6.45 per 2,800 gallons, I think I may say that you will all agree with me that we can at times learn something from our colleagues in foreign countries.

Oil Wells in Burmah and Siam.

One result following upon the English occupation of Upper Burmah is likely to be a development of the oil fields discovered centuries ago, but worked by the natives in the most primitive way, for already in several cases modern pumping plant has been applied with most satisfactory results. Of this progress the superintendent of the Geological Survey of India, Mr. R. D. Oldham, lately gave a most hopeful report to an audience at the Imperial Institute. A long strip of country between Yenangyoung and Yenangyat has been surveyed on a scale of 16 inches to the mile, and demarcated into blocks of 1 mile square, which have been offered to exploiters. In this region oil has been worked for many years, but until 1887 operations were carried out with square shafts rudely lined with timber, in the bottom of which the oil collected and was drawn up in earthen vessels by means of a rope passing over a rude wooden framework. Many deep borings, with steam pumps, are now at work; but there is room for further development in this respect. The actual oil-bearing territory is about 3½ miles long by half a mile wide, and at either extremity are the Burmese villages of Twingon and Beme. There is another oil field at Yenangyat, 54 miles N.N.W. of Yenangyoung and on the right bank of the Irawaddy river. The produce as yet is small, but the oil is under sufficient pressure to allow it to flow naturally at the surface in a suitably arranged borehole. These two oil fields, both of which derive their oil from beds of the same age, and the occurrence of oil mixed with mud on the same horizon at Minbu and in some isolated localities to the north of Yenangyat, show that the oil is spread over a very large area, in which it is almost certain that other fields will be found. Moreover, in this area the rocks are, to a great extent, only moderately disturbed and thrown into well defined anticlinal and synclinal folds, so that the oil fields are likely to yield considerable supplies of petroleum. The total amount of kerosene manufactured in Burmah is about 2½ million gallons, almost equal to the imports; but it is hoped that this will be greatly increased, and that it will be shipped to Calcutta as cheaply as imported oil. At present the total quantity imported into India is over 58 million gallons, the value being 25 million rupees. Upper Assam is known to contain an extensive area of richly petroliferous rocks. As yet this area has only been tested at two points, both chosen solely on account of their nearness to an open line of railway. The greater portion of the region is still too inaccessible for its exploitation to be commercially possible, but it will soon be skirted by the Chittagong-Assam Railway, now in course of construction, and when this is completed there is every prospect of the Assam oil, with the advantages of water carriage, being brought down to Calcutta at a price which will enable it to compete with the imported article. In Cachar and Arakan the prospects are much less bright; in these regions only a moderate development of the industry can at present be looked for, while even this will have to wait till the development of more favored regions has introduced men and materials into the country, and converted a pioneer into an established industry.

The Generation of Steam by the Use of Blast Furnace Gases.

Mr. J. Weidman Murray, in a paper read before the Alabama Industrial and Scientific Society, said:

The utilization of blast furnace gases in the generation of steam has never received the attention and study at the hands of either the blast furnace engineer or the blast furnace manager that its importance would justify.

The furnace that has an adequate amount of steam, even under normal conditions, without resorting to firing, is the exception rather than the rule.

There are many reasons for this condition of things, but there are several that have so frequently come to my notice that I deem them worthy of mention at this time. The first is the faulty method of introducing the gases. The second is the improper combination of same.

In many cases the gases are introduced through burners in each of the forward corners of the battery on the ground level. By this means the gases are allowed to travel a distance of from 10 to 12 feet before they come in contact with the heating surface of the boiler, thereby causthe loss of that much valuable surface. Then, too, locating the burners as described leaves an inadequate space for grate surface, which latter is indispensable, either when blowing in the furnace or at such times when the gases are thin.

The best results have been attained where the gases are introduced inadequately under and close to the boiler, in a broad, thin flame, admitting the air for combustion around the nose of the burner, either by means of small registers or by making the slots in the fronts, where the burners are inserted, large enough to allow all the necessary air for combustion to pass in on all sides and mix with the gases at the nose of the burner.

The quantity of gas can be regulated by means of a sliding damper where the burner is fixed, or the use of the Spearman-Kennedy gas burner, these latter having proven very satisfactory wherever tried.

Several years since I was obliged to dismantle a worn out battery of boilers at the Alice Furnaces, consisting of two 46 inch diameter return flue boilers 34 feet long. Being short of steam much of the time I was extremely anxious to secure the greatest amount of generating surface that the limited space would admit. The available floor space for those boilers was fixed, as they had to be placed between two other batteries then in service. Their elevation, too, was limited, as we had to be governed by the position of a continuous breeching running along the entire length of the boiler plant, to which we were obliged to make connection for the conveying off of the waste gases.

The idea struck me that in designing the new boilers it would be well to build them as large as circumstances would admit, in order to gain generating surface. Then, to still further increase the latter, to suspend a plain cylinder heater under each boiler. By this means we would utilize the major part of the heat thrown out from the superheated wall (much of which was going to waste) as well as put to use what usually is a dead space under the boilers.

This battery, as built, consists of two 54-inch diameter return flues. Immediately under and connected to each of these boilers is a plain cylinder heater 36 inches diameter by 31 feet 2 inches long. These heaters start 8 feet from the front end of the boilers thereby giving ample space for grate surface and bridge wall, which latter is run up high enough to prevent the incoming gases from striking direct against the forward heads of the heaters. These heaters pass through and beyond the rear walls of the battery a distance of 2½ feet. From the under side of these at the extreme rear ends is suspended a 20 inch diameter mud drum. The heaters are hung so as to give them a fall of 6 inches from the forward end to the points to which the mud drum is suspended. The object of extending these heaters through the rear walls of the battery was to secure a point for hanging the mud drum away from the heater where there would be no agitation, and at the lowest point in the heater, thereby forming a natural point of deposit for the sediment. In our experience with these boilers our hopes in this direction have been fully realized, all sediment collected in the boilers having deposited itself in the mud drum, and in that portion of the heater not subjected to the burning gases and at a point where its presence does no material harm. The mud drum is connected to the under side of the heaters by means of 10-inch diameter built legs. A 30-inch diameter steam drum lies across the top of the boilers, and is connected to the latter by means of 14 inch diameter built legs. These drums form perfect equalizers to both the steam and the water between the two boilers.

The same settings, hangings, and about the same amount of brick were used in constructing this battery as that used in the dismantled battery.

The double deck boilers gave us 1,660 square feet of generating surface, as against 1,040 square feet in the dismantled boilers,, or a gain of 61 per cent. The supplementary heater affords us a gain of 59 per cent. over that we would have by simply using the 54-inch diameter return flue boiler, without any additional cost to the plant other than the absolute cost of the heater with its connections, which is but 12 per cent. of the cost of the finished battery.

Our experience with this, the first battery of this type of boiler, taught us that better results could be attained by introducing a jet of gas under the heaters in addition to the one under boilers. So when we found it necessary to still further increase the boiler capacity of the Alice Furnaces by two additional double deck batteries of boilers, I designed a duplex gas burner. The upper burner is covered by the Spearman-Kennedy patents. The connection for the lower burner is made to the stationery base of the upper burner, leading the gas through a 9×9-inch cast pipe, located immediately under the grate bars, to a cast nozzle built in the bridge wall and measuring 24×3 inches at the nose. The air for combustion is admitted from either side of the battery through the superheated walls to a small chamber encircling the burner nozzle. This chamber is reduced, giving 1 inch of space on all sides of said nozzle, at which point the air mixes with the gases and causes combustion.

Our experience, as well as that of some of our neighbors, has been very flattering, both with the duplex boilers and the duplex burners.

Relative Advantages of Toothed and Smooth Core Armatures.

Mr. Alten D. Adams, of Worcester, Mass., says that the merits of different methods of construction in the manufacture of dynamo electric machinery, as in other lines, must evidently be decided by their comparative costs, all else being equal. Although questions concerning the relative merits of toothed and smooth core armatures have long been discussed, very little seems to have been written to show whether actual saving in cost may be effected by one construction over the other, when employed to produce the same results.

The practice of dynamo builders in this country and abroad, embodies both types, and the history of the art records many changes from each to the other. In view of the above, the inquiry, whether in the light of present facts any saving can be effected by the use of toothed core armatures, seems of interest.

The limits of this paper do not permit consideration of this question in connection with all classes of electrical machinery, and its bearing on direct current constant pressure machines only will be taken up.

The principal disadvantages of toothed, compared with smooth core armatures, are greater first cost, large change of lead, excessive sparking, when used with too short air gaps, and the production of heat in pole pieces; their advantages are, that inductors are positively driven, large, solid inductors, protected from eddy currents, and that a reduction may be made in the length and consequent magnetic resistance of the air gap.

Change of lead may be fixed within any desired limits, and sparking abated by such proportions of air gap and teeth as give them sufficient magnetic resistance.

Heat in pole pieces may be reduced by their lamination, by the use of very narrow teeth and slots, by forms of teeth that present a nearly continuous surface of iron to the pole pieces, and still more, by the use of openings in core discs which do not cut through their outside surface, or a continuous magnetic sheath outside the teeth.

For any given form of tooth the heating of pole pieces is less the longer the air gap. The mechanical strength of armature teeth, as usually employed, is far in excess of that required to hold inductors in position, even under conditions of short circuit, and driving pins inserted in the core, at proper intervals, are much cheaper and take up less valuable room on the armature circumference. Either teeth or substantial driving pins are, of course, preferable mechanically to the slender bits of hard fiber which have been much used, and frequently give way under the heavy strains to which large generators are subject. When large wires or copper rods are used as inductors, their protection from eddy currents is an important matter, but proper stranding of inductors reduces the eddy loss in them, when used on smooth cores, to a very small amount, and has the further important advantage that inductors may be bent into the proper shape at armature ends, and the joints, necessary when rods are used, avoided. The chief possible advantage, then, to be gained by the use of toothed armatures, is through a reduction in the length of the air gap, and the consequent reduction in the ampere turns required on field magnet, weight of copper, or energy in winding, and the length and weight of iron core. To make this advantage available, it must be practical to use air gaps shorter than are required for insulation, winding and clearance.

As is well understood, the armature winding of a dynamo or motor, in operation, has a magnetizing action which is measured in ampere turns for a bipolar machine, by one quarter the product of all the inductors of the armature, into the total armature current. The ampere turns on the armature evidently tend to set up a flow of magnetism, having a complete circuit through the armature core, twice across each air gap, and through the iron of pole pieces.

About half the ampere turns furnished by the inductors under pole pieces, evidently act against the field ampere turns in each air gap at the polar tips, and the ratio between the armature and field ampere turns at this point, necessary to give sparkless reversal there, must determine whether the required magnetic resistance be greater or less than that of an air gap long enough for insulation, winding and clearance with a smooth core armature.

As an armature coil in an operating dynamo or motor passes under the brush, the current flowing in it must stop, and one in the opposite direction be set up; and if this action is to be accomplished without sparking, a sufficient electromotive force must be provided in the coil while in direct contact with the brush. In the ordinary dynamo or motor, magnetism forced across the path of the coil, by the field ampere turns expended in air gap, must provide this reversing electromotive force.

The data of a number of smooth core armature machines of different make, show ratios of field to armature ampere turns in air gap, of from about one and one-half to one, to two and one-half to one, and the writer's experience is that a ratio of two to one will give sparkless operation at full load, with brushes set just outside pole corners.

It is a matter of common experience that the ratio between field and armature ampere turns in the air gap may be so reduced, even in machines with smooth core armatures as to require excessive change of lead to secure even approximate freedom from sparking.

If it be desired therefore to build machines having an expenditure of field ampere turns in the air gap not much greater than those of the armature, we need not resort to toothed cores. Take, for example, the case of a 260 ampere dynamo, with 120 inductors on its armature in one layer; an air gap induction of 25,000 lines per square inch, and 80 per cent. of inductors under the pole pieces. An air gap of .45 inch between the armature and each pole piece will be sufficient for insulation, winding and clearance, and the field ampere turns expended in each air gap will therefore be 3,500, while the armature ampere turns, active under each pole tip, will be 3,100. A considerable change of lead and sparking can be readily predicted for this machine. In some types of small machines, the room required by insulation, winding and clearance, makes the air gap longer than necessary for sparkless operation, and in such machines the utility of teeth seems to depend on their cost compared with the saving to be effected by their use.

As the ampere turns, furnished by the inductors under any pole piece, grow less in a machine of given capacity when the number of poles is increased, very short air gaps may be used, if the number of poles is sufficiently large. As an increase in the number of poles usually makes a machine of given capacity more expensive, however, the question at once comes up, to what extent the number of poles may be increased without a greater expenditure than the saving of iron and copper to be effected. In large multipolar machines of four or six poles, such as are commonly used the length of air gap required for sparkless operation, is considerable, and those who have watched the development of these machines with toothed core armatures during the last four or five years, have seen the air gaps gradually widen until machines of this character are not hard to find in which the copper inductors between the teeth could be taken out, wound outside the teeth, and still leave room enough for good clearance.

Additional mechanical security, of course, furnishes a considerable argument for the use of teeth in very large slow speed machines. A number of devices have been suggested from time to time, to enable toothed core armatures to be used with short air gaps, and the consequent saving in iron and copper effected. No machines with these devices, however, have yet stood the test of time and competition with those of ordinary type, and have yet to prove their ability to produce results, as at present attained at a less cost. The seeming opportunity to

save material by the use of toothed armatures is very attractive, and we cannot but hope it may some day be practical; in the light of present knowledge, however, there seems little to be gained by their use in medium and large bipolar machines.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AT the annual meetng of the Consumers Gas Company, of Reading, Pa., the Directors chosen were: Henry Baumgardner, of Lancaster, Pa.; Edward C. Lee, Wayne MacVeagh and Samuel T. Bodine, of Philadelphia, and Richmond L. Jones, of Reading.

A SYNDICATE of Eastern capitalists are anxious to secure control of the gas and electric lighting supply of Chicopee, Mass., and have made an offer for the same. The proprietors of the Chicopee gas works and the Chicopee Electric Light Company are also the owners of the local mills, operated under the name of the Dwight Manufacturing Company, and while they are willing to sell the electric lighting division of their combined enterprises, they are not at all anxious to dispose of the gas works division; and so the matter stands. Under the circumstances, it does not seem likely the trade will go through, since the electric end of the property is not profitable, whereas the gaseous end is and has been a source of revenue.

THE 36th annual meeting of the shareholders in the Port Hope (Ont.) Gas Light Company was held on the 28th of May, President (Mr. John Smart) in the chair. The regular business was introduced by the reading of the following report from the Board of Directors respecting the operations of the Company for the year ended April 30th: "Your Directors with this, their 36th annual report, submit for your approval the statements of receipts and expenditure for the past year, duly audited, the result differs very little from that of 1893. Our sales are slightly less, but that is fully made up by the savings in outlay. Your Directors are therefore enabled to declare the same dividend as last year, of 4½ per cent., which is far from a proper return on capital invested in any business venture, such as a gas company with its attendant risks. All our meters have been reinspected by the Government; but the Company offers, on the request of any customer, to take his meter out at any time and have it reinspected, and, should it be declared fast, to rebate any overcharge and pay the inspector's fees. On the other hand, if it is found to be correct, then the complaining customer must pay the cost of inspection. Under such a rule, no one with any degree of business fairness can reasonably dispute his gas bill, which, as to his consumption and the measure of same is entirely within his own control, just as that of his butcher, grocer or coal merchant. As our gas bills are payable within 30 days, to secure the cash payment rebate, it would be a good saving of time, to both the Gas Company and the customer, if the latter, on the receipt of his bill, would enclose or send to the Secretary his check for the amount of the same, dated when it would fall due. If this rule were strictly followed, the rebate would be secured and the liability to overstep the cash payment limit be avoided. We are naturally very anxious to increase our sales of gas. In order to promote this the Company offers to supply gas stoves and fixtures at wholesale cost and freight, on a cash order. Stoves for cooking with gas are now sold at greatly reduced prices. Summer cooking can be done with them—with comfort, cleanliness, saving of fuel and ash carrying—at about the same cost as with coal and wood. A match starts the fire, producing a heat that is instantaneous and controllable, which is not the case with any other fuel." In moving the adoption of the report, President Smart said: "All things considered, our past year's business has been fairly satisfactory, and better than we looked for six months ago. Some of our customers have found fault with the bills charged against them, and thus fault-finding has mainly proceeded from those who reside in the high level sections of our town. Port Hope holds within it both hill and dale, and naturally, and beyond our control, this means varying pressure in our mains, for the Company regulates its pressure by the needs of its Walton street customers, who are located at a low level, which necessitates an excessive pressure in the upper districts. The consumers, however, have the remedy in their own hands, since they may, by regulating the flow at the meter, do away with all waste occasioned by necessarily excessive pressure. Consumers also might with advantage to themselves watch with some degree of closeness the use of gas in their houses and stores, extinguishing lights when their aid is not required. If due consideration were given to these things, and if the same care were exercised as is required to burn oil or coal with economy, we would have fewer stories told about self-acting meters and exorbitant gas bills. So far as the Gas Company can do, nothing will be left undone to secure to its customers a full supply of good gas. At the meter, however, its responsibility ends, for that is the point of delivery. Naturally, the officers of a gas company are, or ought to be, well informed regarding all matters relating to gas consumption, either used as light or for fuel for summer cooking. I can assure our patrons that such information is at their service, and that it will be a pleasure in this or in any other way to promote pleasant business relations between the Company and its consumers." The report was accepted, with an added resolution by the shareholders expressing their confidence in the management. The old Board of Directors were re elected, and they subsequently again named Mr. John Smart to the posts of President and Managing Director.

MR. B. E. LETANG, formerly General Manager of the Jackson (Cal.) Gas Light Company, has purchased a controlling interest in the same.

AT the annual meeting of the Mount Pleasant (Pa.) Gas Company the following result was reached: Directors, F. M. Husband, J. L. Ruth, J. Wade Shupe, John Husband, Thos. Seaton, C. E. Mullin and O. P. Shupe; President, F. M. Husband; Secretary, J. L. Ruth; Treasurer, J. Wade Shupe.

THE Lowell (Mass.) Gas Light Company has arranged to extend its pipes through the main streets of the adjoining suburb known as Navy Yard Village.

A CORRESPONDENT, writing from Liberty, Ind., under date of May 29th, says: "You can find something of interest, though not of much value to your readers, by investigating the Pennock Electric Company, of 21 Hamilton street, Boston, Mass., the proprietors of which claim to be able to compete with gas at 5 cents per 1,000 cubic feet. In fact, by their method they claim they can maintain 1,000 incandescent 16 candle power lamps at a less cost than 100 lamps of the same candle power can be maintained by the 'ordinary dynamo system.' Another claim is that a 108 light plant can be put in, equipped completely, for $1,000, which plant can be increased to keep up 1,000 lamps at a cost not to exceed an additional $100. 'Manager' Pennock asserts that he has sold the rights for the State of Michigan, to F. B. Richmond, of Detroit, who paid therefor $500 in cash, and agrees to pay $500 more on October 1st, when the first Wolverine plant is to be finished. Pennock starts one of his circulars with the musical strain, 'Listen to the dickey birds.'"

MR. T. C. LEGGETT, formerly Secretary of the Iowa Investment Company, of Sioux City, Ia., has been appointed receiver of the Le Mars (Ia.) Gas Light Company, and he is now in full control of the property. Many radical changes will be made in physical condition of the plant, and it is also proposed to take some trouble with the consumers; that is, to pay some attention to their reasonable demands.

THE Louisville (Ky.) *Times*, of May 31st, has the following to say: "The sale of gas stock, which was held to day at noon in the Exchange Hall of the Board of Trade, was the cause of the assemblage of a large number of prominent merchants, bankers and business men. There were over 200 in the room. At 12 o'clock, President George W. Morris called the meeting to order and read the terms of sale, which were as follows: The sale is to be made as of the date of January 1, 1894, with interest added, on the par value of each share sold at the rate of 6 per cent. from January 1, until payment in full is made. All cash payments on account of purchases will be credited at the same rate of interest, except on the payment of June 1st, of $2.50 per share for accrued interest from January 1 to June 1, 1894. On this sum no interest will be allowed; $20 per share on June 1 and $2 50 per share accrued interest for 5 months' from January 1, 1894; $10 per share on July 10, upon which a cash dividend of $3 per share will be accredited; $10 per share on August 1; $10 per share on September 1; $10 per share on October 1; $10 per share on November 1; $30 per share on December 1, 1894, with premium on sale and all accrued interest to December 1, when certificate of stock will be issued. The Company issues negotiable receipts, on account of purchases of stock, but those who so desired had the option of paying full for the amount of his purchase, with interest added from January 1, at the rate of 6 per cent., and to those the certificates of stock were issued at once. A deposit of $5 per share was required on each purchase. The sale of 6,000 shares was for the liquidating the floating debt recently incurred by the erection of the electric light plant at 14th and Magazine streets, and leaves but 4,000 shares which may be issued. The capital stock of the Company now is $3,600,000, and the limit is $4,000,000. The dividend on the stock was reduced recently at a meeting of the stockholders from 7 to 6 per cent. About 10 minutes past 12 Auctioneer Meddis took the stand and began to sell, one share being offered, with the privilege of 500 shares. The

first share was started at par, and after slow bidding the first sale of 10 shares was made at 101¼ to C. L. Woodbury. The 6,000 shares were eventually disposed of at an average of 100¼."

MR. G. W. BENEDICT, of Liberty, Ind., writing under date of June 2d, says: "According to my promise of some weeks ago, I write to inform you of the result of Mr. Fulton's efforts to find natural gas at Richmond, Ind., by means of his 'electrical contrivance,' which was mentioned in the JOURNAL of some weeks ago. They bored 2,500 feet and passed through a small supply of 'shale' gas at 1,450 feet; but that was all. So the man with the 'infallible electrical contrivance' for finding oil or gas has again failed. This failure, Mr. Fulton claims, is simply an exception going to prove the rule."

THE public lighting of New Brunswick, N. J., was awarded on Monday last in accordance with the following resolution adopted by the Board of Aldermen: "That the contracts for the lighting of the city streets for the next two years be awarded to the Gas Light Company of the city of New Brunswick, and the New York and New Jersey Globe Gas Light Company, as per their bids made out and presented May 25, to wit: To the New Brunswick Gas Company at $13.62 per lamp per year, less 5 per cent., for 227 nights lighting, making the net price $12.94 per lamp; to the New York and New Jersey Globe Gas Light Company at 6¼ cents per lamp per night, said company to erect all lamps and poles at its own expense; and that the mayor and clerk be authorized and directed to execute such contracts on the part of the city.'

THIS action seems to mean that the authorities of New Brunswick have tried incandescent electric lamps for street illumination and have found them wanting; for the city has been lighted by means of 16 candle power incandescent electrics for some time back. According to the resolutions, as above given, we think it safe to say that New Brunswick's change of heart is positive.

COX'S gas flow computer is having a good sale, and it must be admitted that it is a most useful device. The Superintendent of a prominent New Jersey Gas Company, in acknowledging the receipt of one of the computers, wrote to Mr. Cox as follows: "Your gas flow computer is at hand, and I have found it to be a most convenient article. It deserves the patronage of every gas company of any consequence."

THE Louisville, (Ky.) Gas Company has determined to again charge a meter rental, which practice is necessitated, according to Treasurer Lee, by the great number of meters, the monthly consumption of which is virtually *nil*. To use his own words: "The matter of charging rent for meters was referred to a committee, who, after a thorough investigation, and consultation with good legal talent, reported in favor of the plan. The step is to be taken because of the great number of small gas bills; in fact, during the months of July and August no less than 500 meters would fail to show any change in their indexes, yet such meters had to be inspected, and such customers required just as much attention as those who use large quantities of gas. The Company has been losing money on this branch of business for some time back, for though the quantity of gas sent out in the past six months or so was less than that sent out for the corresponding period of 1893, the number of consumers is greater this year than last. The Company charged meter rents some years ago, and its present charter permits it to renew the practice." We understand that the lowest charge for a meter will be 10 cents per month, the highest charge to be 25 cents per month.

THE gas plant at Albion, N. Y., has changed hands, having been purchased by Mr. A. L. Tennessy, who also controls the works at Medina, N. Y. The works will be overhauled, and the selling rate has been reduced to $2 per 1,000 cubic feet for illuminating uses. The fuel rate is fixed at $1.50. If we mistake not, this is equal to a cut of 33⅓ per cent.

THE Boston *Herald*, of May 30th, says that "a voluminous petition asking for the appointment of Dr. William A. Rust as a member of the Massachusetts Gas and Electric Light Commission, has been received by Governor Greenhalge. There will be a vacancy in the Commission on July 1st, owing to the expiration of the term of Colonel John G. Wheelright. Many friends of Colonel Wheelwright have asked for his reappointment, but no formal petition has been presented in his behalf. It is said there are a round dozen of applicants for the place."

ANOTHER proposed Gas Company for Washington, D. C., is to be found in a bill recently introduced in the House of Representatives, by Mr Livingston. The measure provides for the incorporation of the National Gas and Electric Light, Heat and Power Company, the incorporators being given as Messrs. J. Wesley Bovee, F. P. B. Sands, Anthony Pollock, Chester A. Snow, Chas. G. Bryan, George W. Harvey, John F. Chamberlain, J. W. Childers, Davies Murdock, S. S. McKim and George B. Cowlam. The capital is put at $2,000,000, and it is stipulated that the Company shall furnish a gas not less than 24 candle power, charging therefor not to exceed 60 cents per 1,000 cubic feet on public account, and not to exceed 75 cents per 1,000 to ordinary consumers.

THE proprietors of the Dunkirk and Fredonia (N.Y.) Street Railway Company have submitted a proposition to the Village Trustees offering to purchase the municipal electric lighting plant at an appraised value, the Railway Company agreeing to furnish the arc lights maintained for public lighting at the rate of $25 per annum each. The probability is that the proposition will be accepted, a consummation which will furnish another instance of the ability of private enterprise to outdo municipal methods of managing private commercial matters.

THE Bradford (Pa.) Electric Light and Power Company offer to maintain 60 standard 2,000 candle power arc lights on public account at the rate of $85 each per annum; if 80 arcs are ordered the price is to be $82.50 each; if 100 arcs are agreed upon the price is to be $80 each.

MR. DOUGLAS, of the Minneapolis Gas Light Company, whose purchase of the Eau Claire (Wis.) works was noted in the JOURNAL for last week, does not sever his connection with the Minneapolis Company until July 1st.

CITY ATTORNEY RASCH, of Detroit, decided recently that the Detroit Gas Company, under the new ordinance, cannot require consumers to deposit a sum of money as a guarantee that gas bills will be paid.

ACCORDING to the annual report of the Massachusetts Board of Gas and Electric Light Commissioners, the total sum paid by the Massachusetts Gas Companies in taxes, for the past year, including State inspection, after apportioning to electric account that part of the Companies' taxes belonging to their electrical departments, was $282,244.39, an average of 6.6 cents per 1,000 cubic feet of gas sold; being an increase over the previous year in the total amount of $7,863.47, and a decrease of .2 cent per 1,000 cubic feet sold.

AT the annual meeting of the stockholders of the Georgetown (D. C.) Gas Light Company the officers chosen were: Directors, H. C. Winship, William Leetch, C. W. Copley, William Orme, Thos. Knowles, John Mahoney, Thos. Brown and M. J. Adler; President, H. C. Winship; Secretary, Thomas Knowles; Superintendent, S. M. Middleton.

THE Directors chosen at the annual meeting of the Williamsburgh (N.Y.) Gas Light Company were: Henry Steers, James S. Beams, Geo. P. Sheldon, William J. Logan, John T. Willets, W. H. H. Childs and John C. Orr.

FRED. WEINGARTNER has been appointed foreman of the Doylestown (Pa.) gas works, vice George Shelmire, resigned.

AT the annual meeting of the Pottstown (Pa.) Gas and Water Company the following officers were chosen: Directors, M. S. Longaker, P. L. Egolf, J. B. Lessig, John W. Storb, Calvin Fegely; President, Geo. B. Lessig; Secretary and Treasurer, J. H. Maxwell.

THE annual meeting of the stockholders of the Camden (N. J.) Gas Light Company, which was held on the 5th inst., resulted as follows: Directors, Benjamin F. Archer, Charles Watson, S. C. Cooper, John McIlhenny and Richard F. Smith; President, B. F. Archer; Secretary and Treasurer, Charles Watson.

THE municipal electric lighting plant in Allegheny City, Pa., is to be enlarged at a probable expenditure of $35,000, although when it was originally installed the pledge was made that it would equal the demands of the city for years to come.

THE lectures on gas cookery at Fitchburg, Mass., by Mrs. M. L. Wade, of Boston, which were given under the direction of the local Gas Company, were largely attended, and the result has been the receipt by the Gas Company of many orders for ranges.

THE Kendall gas making process is to be given a thorough trial at the new works at Laconia, N. H.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

MONDAY, JUNE 11, 1894.

The Market for Gas Securities.

The market for city gas shares was dull and weak since time of last writing, the opening figures for Consolidated to-day (Friday) being 134 bid, offered at 134¼. Shares are likely to go lower, for the impression steadily gains ground that gas rates are soon to be put at the $1 mark in the two large cities, which figure is to be reached without legislative intervention. The New York and East River Company has canvassers out offering time contracts to consumers on the dollar basis, although it will be many a day before that concern will be in a position to sell gas on its own account.

In Brooklyn the situation is unchanged, but the stiffening in values is still in evidence, which rather goes to show that something in the nature of a compromise is in the cards. Meanwhile, we repeat our remark that the shares seem to offer better opportunity for profit as a sale than as a purchase. The recent rapid rise in Consumers, of Jersey City, is explained on the ground that a dividend is to be declared. The return will not be less than 1 per cent. quarterly, with a chance that it will be fixed at 1¼ per cent. Chicago gas is remarkably strong, having been traded in at noon at 76⅝. Baltimore Consolidated is offered at 64¾, and Bay States is in some demand, at 15¼ to 15½.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
16 WALL ST., NEW YORK CITY.

JUNE 11.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	134	134¼
Central	500,000	50	100	—
" Scrip	220,000	—	100	—
Equitable	4,000,000	100	185	188
" Bonds	1,000,000	—	106	108
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	—	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	80	95
" Bonds	150,000	—	—	100
Richmond Co., S. I.	348,650	50	50	—
" Bonds	100,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	—	31
Preferred	5,000,000	100	76	78
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	107
Citizens	1,200,000	20	50	—
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co.	2,000,000	100	—	—
Bonds	1,000,000	—	—	—
Fulton Municipal	3,000,000	100	130	132
" Bonds	300,000		103	—
Peoples	1,000,000	10	—	70
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	98	100
Metropolitan	870,000	100	132	136
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	—	160
" Otfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	138	145
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Bay State Gas Co.—				
Stock	5,000,000	50	15¼	15½
Income Bonds	2,000,000	1000	60	—
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	78	—
2d " " "	3,000,000	1000	57	58
Buffalo Mutual, N. Y.	750,000	100	121	125
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	76	76¼
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	81⅛	81½
Consumers Gas Light Co., Jersey City	2,000,000	100	50	60
Bonds	600,000	1000	90	95
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	184½	187
Central, S. F., Cal			90	100
Capital, Sacramento, Cal			—	55
Consolidated, Balt	11,000,000	100	63⅞	64⅞
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
Con. Bonds			60	—
East River Gas Co., Long Island City	1,000,000	100	—	—
Bonds	500,000	100	89¼	—
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	190	200
Louisville, Ky	2,570,000	50	125	130
Laclede Gas Light Co. St. Louis, Mo.—				
Common Stock	7,500,000	100	16	17
Preferred "	2,500,000	100	66	69
Bonds	9,034,400	1000	—	86¼
Little Falls N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
New Haven, Conn		25	200	—
Oakland, Cal			42⅝	43
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Peoples, Jersey City			160	170
" " Bonds			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	80	85
Preferred			90	95
Bonds			90	95
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal	10,000,000	100	71	71½
Washington, D. C	2,000,000	20	240	—
Wilmington, Del.	500,000	50	180	182

Advertisers Index.

GAS ENGINEERS. Page
Jos. R. Thomas, New York City 858
Wm. Henry White, New York City 871
Fred. Bredel, New York City 867
H. C. Slaney, New York City 858
Geo. R. Rowland, New York City 858
Joseph P. Gill, New York City 858

CHEMISTS.
Durand Woodman, New York City 858

PROCESSES.
Bartlett, Hayward & Co., Baltimore, Md 869
United Gas Improvement Co, Phila, Pa 861
Burdett Loomis, Hartford, Conn 871
National Gas and Water Co., Chicago, Ills 863
Economical Gas Apparatus Construction Co., Toronto, Ont. 862
The Western Gas Construction Co., Fort Wayne, Ind 862

GAS WORKS APPARATUS AND CONSTRUCTION.
James R. Floyd & Sons, New York City 871
Continental Iron Works, Brooklyn, N. Y 870
Deily & Fowler, Phila., Pa 871
Kerr Murray Mfg. Co., Fort Wayne, Ind 868
Stacey Mfg. Co., Cincinnati, Ohio 871
Bartlett, Hayward & Co., Baltimore, Md 869
Davis & Farnum Mfg. Co., Waltham, Mass 868
R. D. Wood & Co., Phila., Pa 870
Isbell-Porter Company, New York City 870
Fred. Bredel, New York City 867
United Gas Improvement Co., Phila., Pa 861
Berlin Iron Bridge Company East Berlin, Conn 858
National Gas and Water Co., Chicago, Ills 863
Economical Gas Apparatus Construction Co., Toronto, Ont. 862
The Western Gas Construction Co, Fort Wayne, Ind 862
C. Cunningham, Brooklyn, N. Y 856

SCRUBBERS AND CONDENSERS.
G. Shepard Page's Sons, New York City 872
R. D. Wood & Co., Phila., Pa 870
James R. Floyd & Sons, New York City 872
Continental Iron Works, Brooklyn, N. Y 870

REGENERATIVE FURNACES.
Bartlett, Hayward & Co., Baltimore, Md 869
Fred. Bredel, New York City 867
J. H. Gautier & Co., Jersey City, N. J 867
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 866

TAR AND CARBONIC ACID EXTRACTOR.
Geo. Shepard Page's Sons, N. Y. City 872

AMMONIA CONCENTRATOR.
Michigan Ammonia Works, Detroit, Mich 855

GAS METERS.
John J. Griffin & Co., Phila., Pa 874, 840
American Meter Co., New York and Philadelphia 875
The Goodwin Meter Co., Philadelphia, Pa 472
Helme & Mellhenny, Phila., Pa 875
D. McDonald & Co., Albany, N. Y 875
Nathaniel Tufts, Boston, Mass 874
Maryland Meter and Manufacturing Co., Baltimore, Md 874
Harris Bros. & Co., Philadelphia, Pa 874
Metric Metal Co., Erie, Pa 875

GAS AND WATER PIPES.
Ohio Pipe Co., Columbus, Ohio 873
M. J. Drummond, New York City 873
R. D. Wood & Co., Phila., Pa 870
Warren Foundry & Machine Co., New York City 873
Donaldson Iron Co., Emaus, Pa 873
Addyston Pipe and Steel Co., Cincinnati, O 873
John Fox, New York City 873

STEAM BLOWER FOR BURNING BREEZE.
H. E. Parson, New York City 867

GAS COALS.
Penn Gas Coal Co., Phila., Pa 865
Perkins & Co., New York City 864
Despard Gas Coal Co., Baltimore, Md 865
Westmoreland Coal Company, Phila., Pa 865

CANNEL COALS.
Perkins & Co., New York City 864
Log Mountain Coal, Coke and Timber Co., Pineville, Ky 865

GAS ENRICHERS.
Standard Oil Co., Cleveland, Ohio 865
The Sun Oil Co., Pittsburgh, Pa 865

COKE CRUSHER.
C. M. Keller, Columbus, Ind 865

INCLINED RETORTS.
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 866

AIR COMPRESSORS.
Clayton Air Compressor Works, New York City 819

COAL TAR PUMPS.
Clayton Air Compressor Works, New York City 853

GAS GAUGES.
The Bristol Co., Waterbury, Conn 867

GAS GOVERNORS.
Connelly Iron Sponge and Governor Co., New York City 63
Wilbraham Baker Blower Co., Phila., Pa 863
Isbell-Porter Co., New York City 870

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J 866
B. Kreischer & Sons, New York City 866
Adam Weber, New York City 866
Laclede Fire Brick Mfg. Co , St. Louis, Mo. 866
Borgner & O'Brien, Phila., Pa 866
James Gardner, Jr., Pittsburgh, Pa 866
Henry Maurer & Son, New York City 866
Baltimore Retort and Fire Brick Co., Baltimore, Md 866
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 866
Brooklyn Fire Brick Works, Brooklyn, N. Y 866
F. Behrend, New York City 855

CEMENTS.

C L Gerould & Co., Mount Vernon, N. Y 866
F. Behrend, New York City 855

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y 867
W C. Whyte, New York City 867

GASHOLDER PAINT.

The Government Waterproof Paint Co., Boston, Mass 869
New York Marine Paint Co., Poughkeepsie, N. Y 869

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Company, New York City 870
Continental Iron Works, Brooklyn, N. Y 870

BURNERS.

C. A. Gefrorer, Phila., Pa 858
Moses G. Wilder, Phila., Pa 855

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Greenpoint Chemical Works, Brooklyn, N. Y 863
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Isbell-Porter Company, New York City 870
Wilbraham Baker Blower Co., Philadelphia, Pa 863
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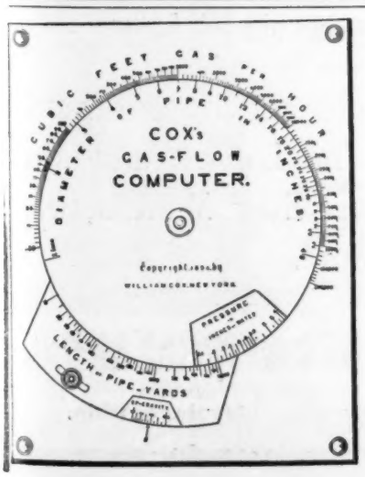

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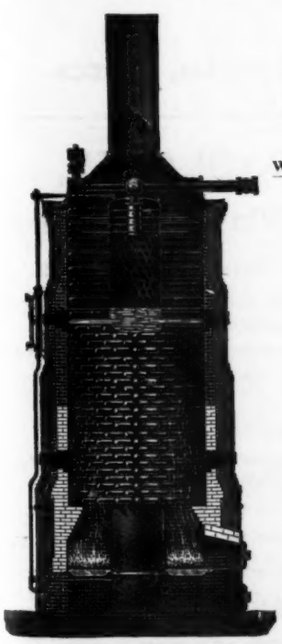

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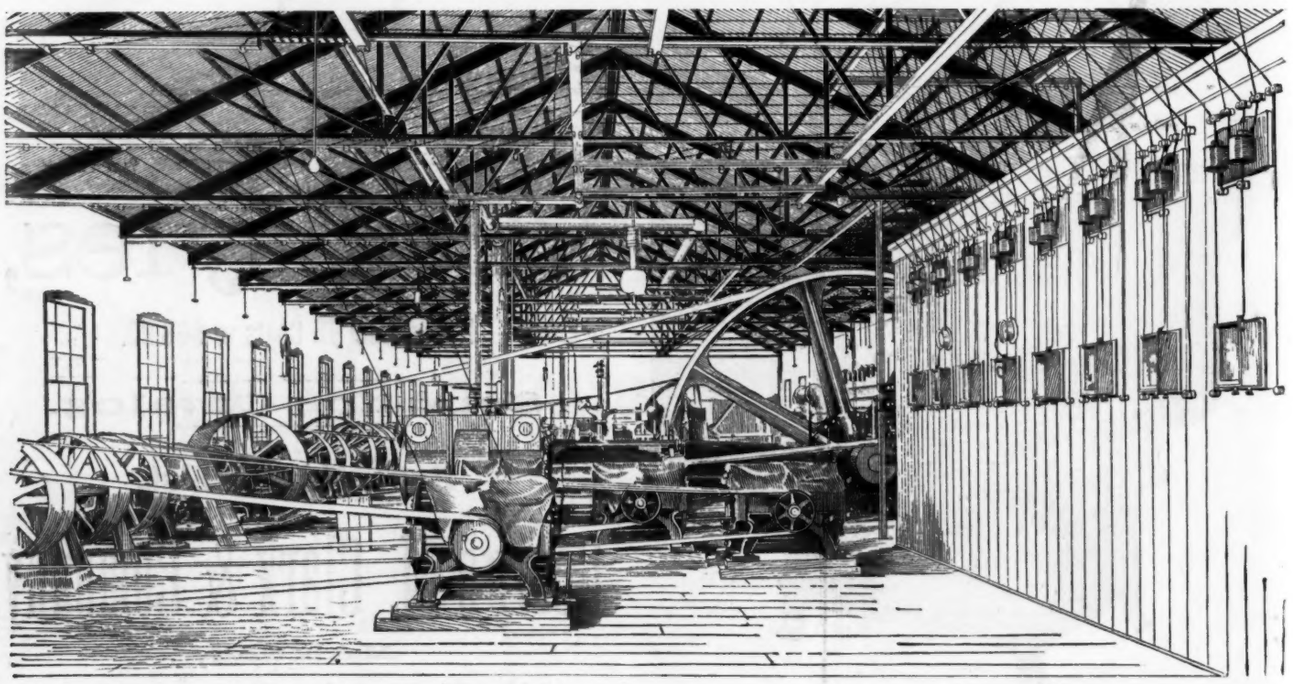

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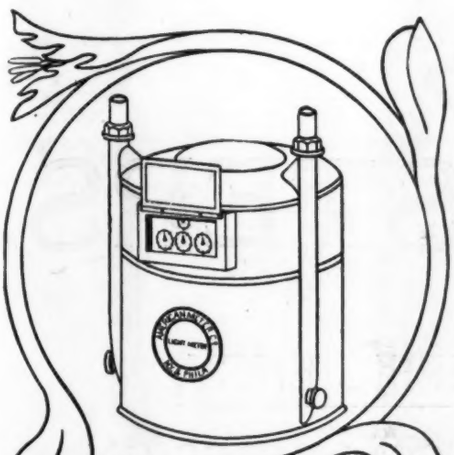

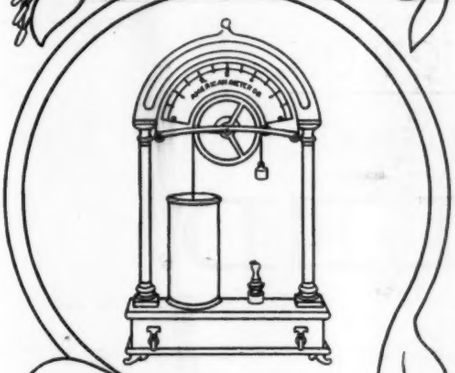

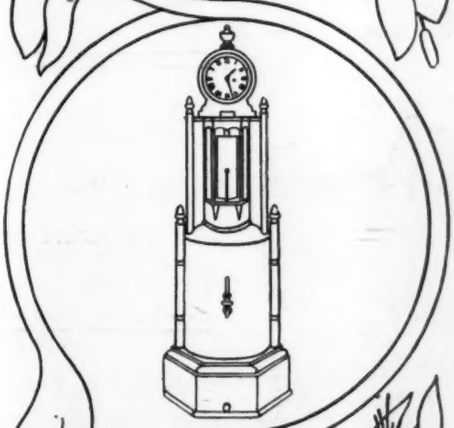

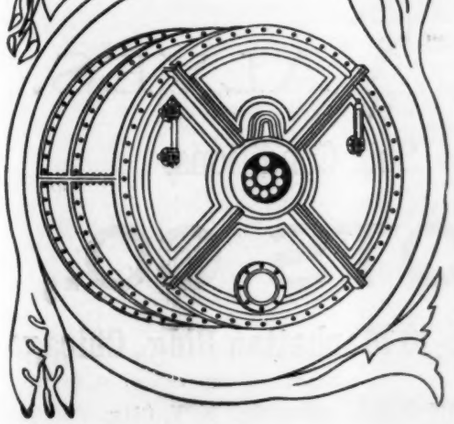

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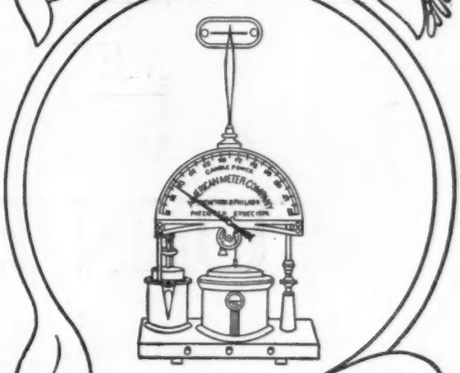
PUBLIC LIGHTING TABLE.

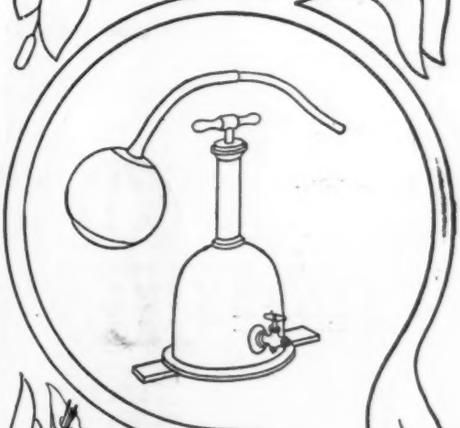
JUNE, 1894.

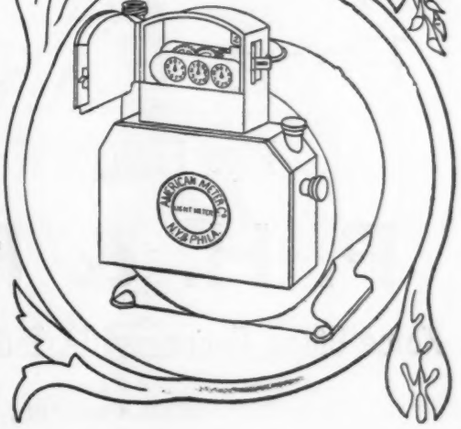
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Fri.	1	7.50 PM	3.30 AM	7.15	3.15
Sat.	2	7.50	3.30	7.15	3.15
Sun.	3	7.50 NM	3.30	7.15	3.15
Mon.	4	7.50	3.30	7.25	3.15
Tue.	5	7.50	3.30	7.25	3.15
Wed.	6	7.50	3.30	7.25	3.15
Thu.	7	8.00	3.30	7.25	3.15
Fri.	8	10.50	3.30	7.25	3.15
Sat.	9	11.20	3.30	7.25	3.15
Sun.	10	11.40 FQ	3.30	7.25	3.15
Mon.	11	12.00	3.30	7.25	3.15
Tue.	12	12.30 AM	3.30	7.25	3.15
Wed.	13	12.50	3.30	7.25	3.15
Thu.	14	1.20	3.30	7.25	3.15
Fri.	15	1.50	3.30	7.25	3.15
Sat.	16	No L.	No L.	7.25	3.15
Sun.	17	No L.	No L.	7.25	3.15
Mon.	18	No L. FM	No L.	7.30	3.15
Tue.	19	8.00 PM	10.10 PM	7.30	3.15
Wed.	20	8.00	10.50	7.30	3.15
Thu.	21	8.00	11.20	7.30	3.15
Fri.	22	8.00	11.50	7.30	3.15
Sat.	23	8.00	12.10 AM	7.30	3.15
Sun.	24	8.00	12.30	7.30	3.15
Mon.	25	8.00	12.50	7.30	3.15
Tue.	26	8.00 LQ	1.10	7.30	3.15
Wed.	27	8.00	1.30	7.30	3.15
Thu.	28	8.00	2.00	7.30	3.15
Fri.	29	8.00	2.40	7.30	3.15
Sat.	30	8.00	3.30	7.30	3.15

TOTAL HOURS LIGHTING DURING 1894.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	244.10	January	423.20
February	195.30	February	355.25
March	206.20	March	355.35
April	169.40	April	298.50
May	162.10	May	264.50
June	135.40	June	234.25
July	146.30	July	243.45
August	162.20	August	280.25
September	174.10	September	321.15
October	211.20	October	374.30
November	221.00	November	401.40
December	245.30	December	433.45
Total	2274.20	Total	3987.45







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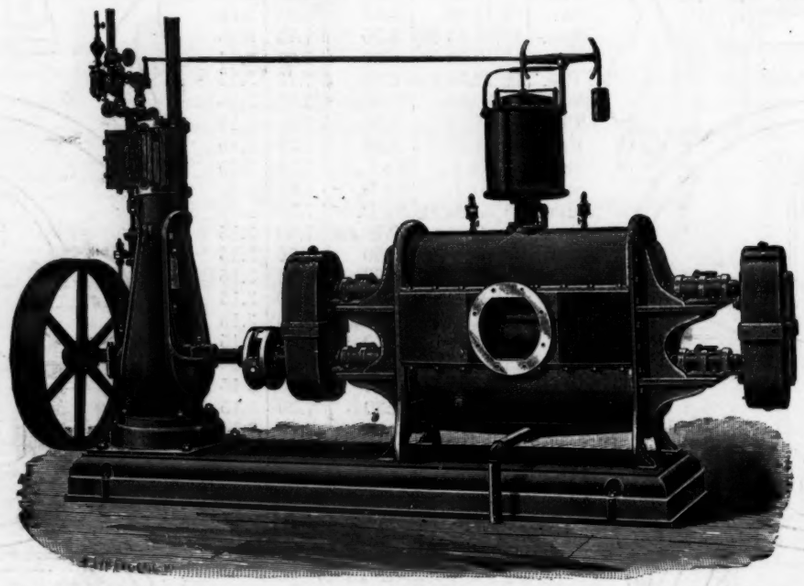

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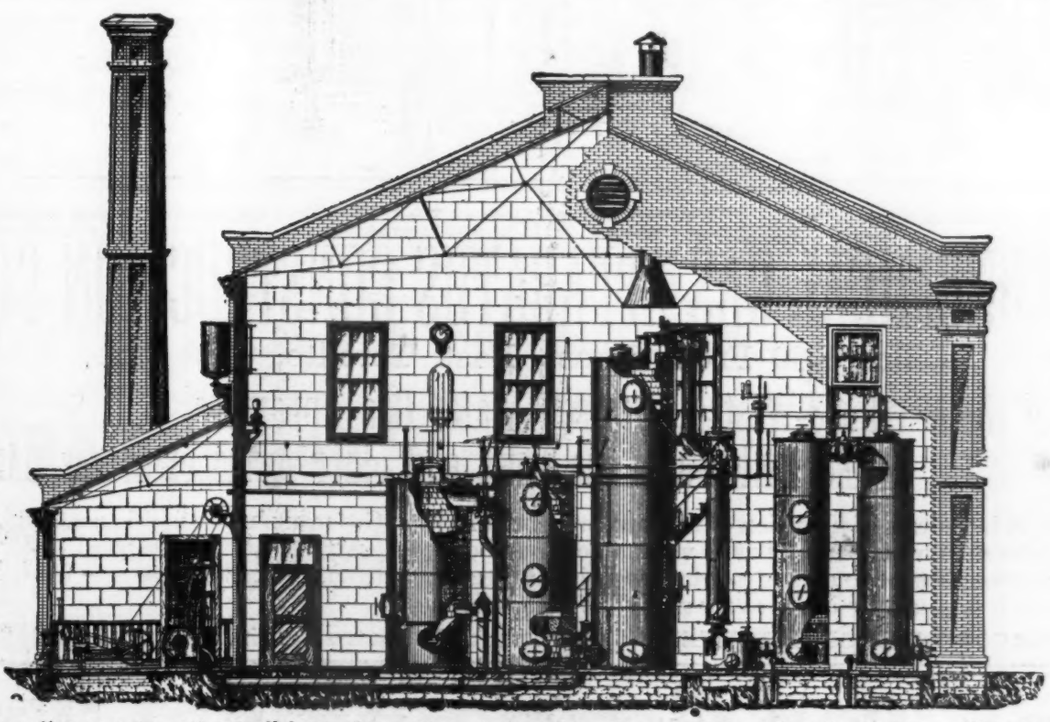

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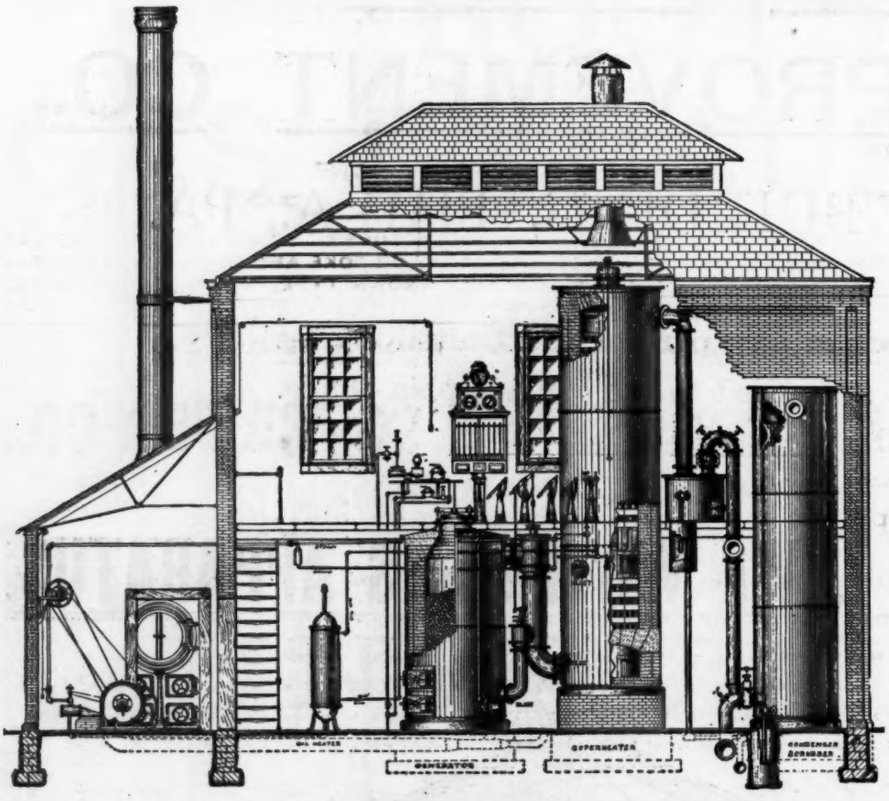

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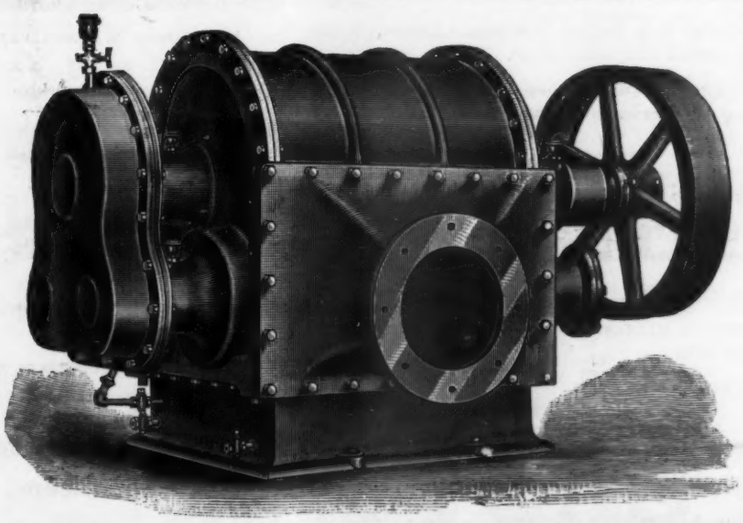

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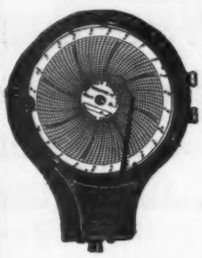

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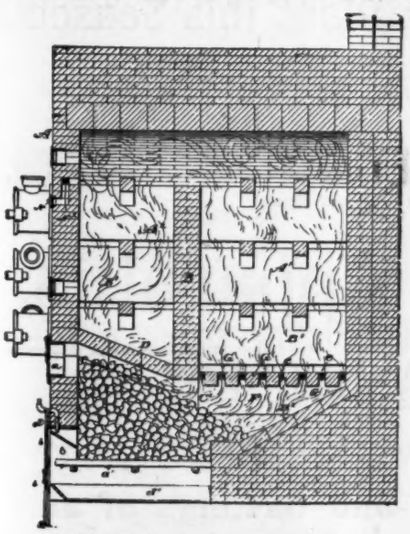

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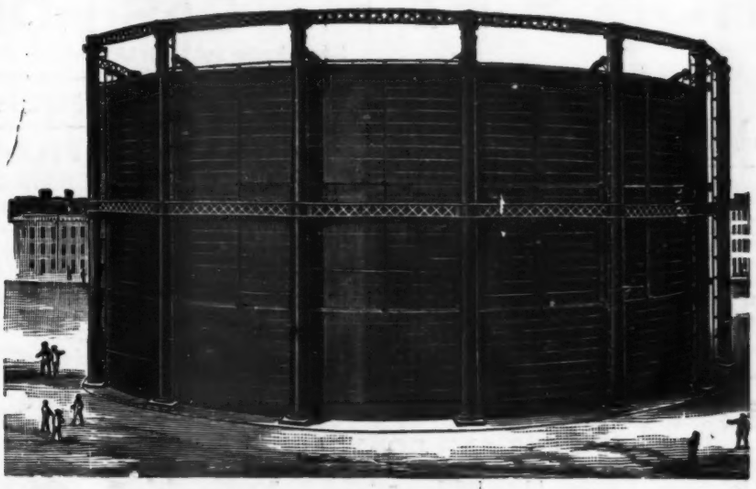

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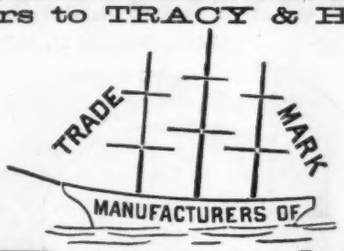

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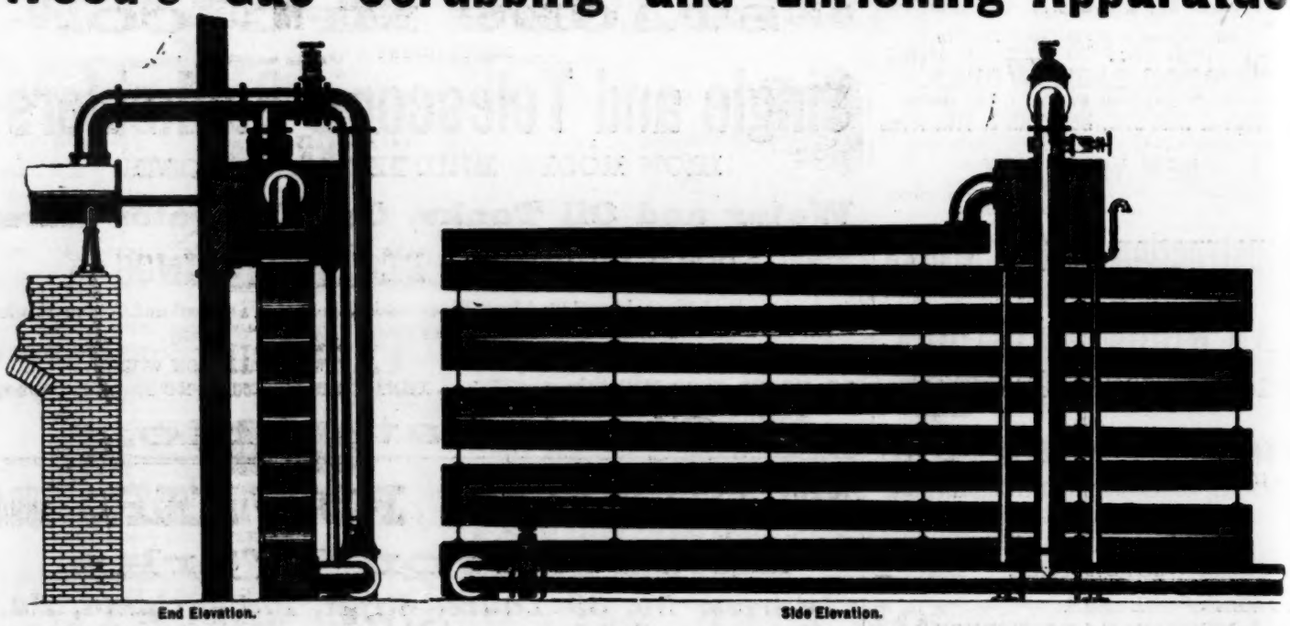

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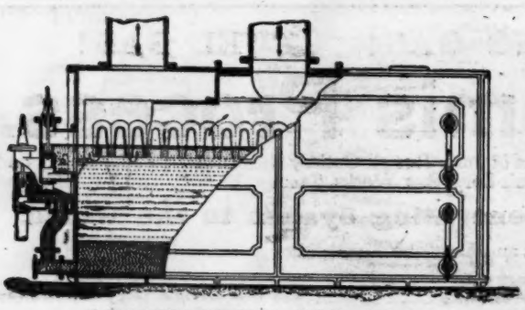

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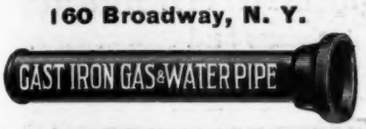

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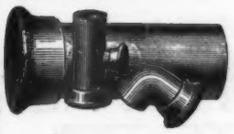

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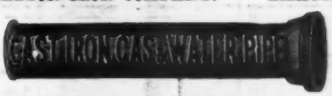

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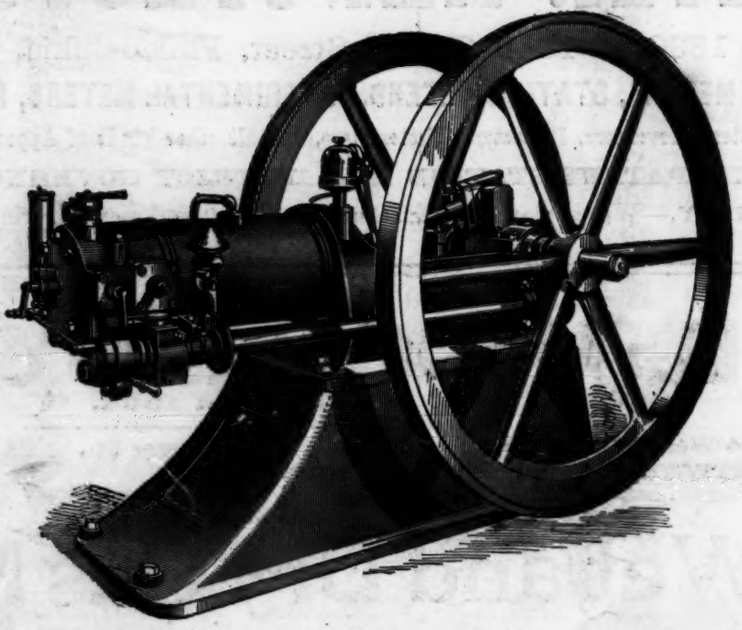

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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—

Committee on Nomination of Officers, American Gas Light Association..... 877

Committee of Arrangements, American Gas Light Association.... 877

EDITORIALS—

Briefly Told 877

The First Annual Meeting of the Pacific Coast Gas Association—The Brooklyn Situation—The Montclair (N. J.) Council and Street Lighting by Electric Incandescent Lamps—Notes.

Seventeenth Annual Meeting, Western Gas Association - Official Report—Revised by the Secretary - Concluded from page 849... 878

Second Day, Morning Session—*Wrinkle Department—Some Retort House Devices—Stock Valve for Bench Chimneys—Admission of Air for Reviving Iron Oxide—Using a Dry Meter, Admitting Air for Revivification—Signaling Excessive Vacuum at the Exhauster—Safety Arrangement for Seals—By-Passing the Lower Tray of a Purifier—Filter for Tar Well Overflow—Using Bench Waste Gases under a Boiler—Basket for Melting Out Lead Joints—Analysis of Gas by Inspection—Portable Pipe Vise Bench—Taking Gas Temperatures at the Consumer's Meter—A Gas Gauge Float—Notes on the Disposal of the Wash Water from Water Gas Plants—The Question Box—Committee of Arrangements for '95—Final Resolutions—An Invitation—Adjourned.

Means of Preventing Fires from Petroleum Spirit in Chemical Cleaning..... 884

Second Annual Meeting, Pacific Coast Gas Association—Official Report..... 885

First Day, Morning Session—Roll Call—Election of New Members—Report of Secretary and Treasurer—President's Address—Appointment of Committees—Purification of Gas, by Mr. E. C Jones—Discussion—Small Things Around a Small Gas Works, by Mr. M. C. Osborn—Discussion—How We Do at Our House, by Mr. T. R. Parker—Discussion—First Day, Afternoon Session—The Relations of Lighting Companies to the Public, by Mr. C. W. Quilty—Discussion—Proper Books of Record, by Mr. John A. Britton—Discussion—Foes to Our Gas Mains and Service Pipes, by Mr. John Kempf, Jr.—Discussion—Election of Officers—Next Place of Meeting—Letters of Regret—The Question Box—First Day, Evening Session—The Banquet—Second Day—The Outing—Adjourned.

Electricity as a Source of Light..... 899

The Structure and Chemistry of the Cyanogen Flame..... 899

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 900

The Dollar Mark, at Springfield, Ills.—Contracts for the Kerr Murray Manufacturing Company—Cheaper Gas for Hoboken, N. J.—Annual Meeting of the Toledo (Ohio) Company—The Minneapolis Hearing—"Crighton" Boxes for the Portsmouth (Ohio) and Alton (Ills.) Companies—Annual Meeting, Pawtucket, R. I.—Electric Annex for the Geneseo (N. Y.) Company—Proposed Opposition for Hornellsville, N. Y.—Objecting to a Meter Rent, Louisville, Ky.—A Unique Damage Suit—The Bay State Company's Output Increasing—Public Lighting by Electricity, Cincinnati, Ohio—Mr. Lansden Institutes a Libel Suit against the Washington (D. C.) Company—Defeat of the Brown Ordinances, Phila., Pa.—And Other Items.

The Market for Gas Securities 902

[OFFICIAL NOTICE.]

Committee on Nomination of Officers, American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., May 25, 1894.

I hereby give official notice that, at a meeting of the Council of this Association, held at Cleveland, O., May 15, 1894, there were appointed (as per the appended list) members of the Committee to Nominate Officers for the Association for the year beginning October 19, 1894, said Committee to report to the Association on October 17, 1894, at Washington, D. C.:

F. H. Shelton (Chairman), Philadelphia, Pa.; M. S. Greenough, Cleveland, O.; D. H. Geggie, Quebec, Canada; F. S. Richardson, North Adams, Mass.; G. T. Thompson, St. Louis, Mo.

Respectfully, A. B. SLATER, JR., Secretary.

[OFFICIAL NOTICE.]

Committee of Arrangements, American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., May 25, 1894.

I hereby give official notice that at a meeting of the Council of this Association, held at Cleveland, O., May 15, 1894, there were appointed (as per the appended list) members of the Committee on Arrangments for the 22d annual meeting of this Association, to be held at Washington, D. C., beginning on October 17, 1894:

C. B. Bailey (Chairman), Washington, D. C.; J. S. McIlhenny, Washington, D. C.; Wm. Henry White, New York City; John McIlhenny, Philadelphia, Pa.; T. J. Hayward, Baltimore, Md.; C. H. Dickey, Baltimore, Md.; Frederic Egner, Norfolk, Va.; A. B. Slater, Jr., Providence, R. I.

Respectfully, A. B. SLATER, JR., Secretary.

BRIEFLY TOLD.

THE FIRST ANNUAL MEETING OF THE PACIFIC COAST GAS ASSOCIATION.—Elsewhere in this issue will be found a complete report of the First Annual Meeting of the Pacific Coast Gas Association, for a copy of which we are indebted to Mr. John A. Britton, the Association's Secretary and Treasurer. The most superficial examination of the report cannot fail to convince the examiner that the meeting was in all respects a success, the technical portion of the proceedings indeed being quite up to the mark of the Associations that have been longer in the field. The convention was favored with good weather, and the social side of the gathering was marked by many attentions bestowed in true Pacific Coast fashion by the Capital Gas Company, of Sacramento, whose courtesy was all the more worthy of remembering and enjoying when one recollected that less than a month before the Company was visited by a disastrous conflagration which demolished its electric lighting plant, entailing a loss that amounted to many thousands of dollars. It is like gilding gold to say that President Crockett was fully up to the duties of his position; but we must add that many of the "Coasters," who met him at Sacramento for the first time, were unprepared, in some measure at least, for the clever inaugural address to which they listened. Crockett, however, is nothing if not versatile, and it is little to be wondered at that the Association was unwilling to accept his refusal to serve another term in the presidential chair, without making a strong appeal to him to reconsider that determination. The declination, however was final, and his reasons were really unanswerable. His successor, Mr. Quilty, of San Jose, is the sort of man to go on with the good work, and aided by Mr. Britton, of Oakland, whose clerical connection with the Oakland Company has "made him a man of methods," there is little fear that the young Association will not go on to fame, with never a backward step.

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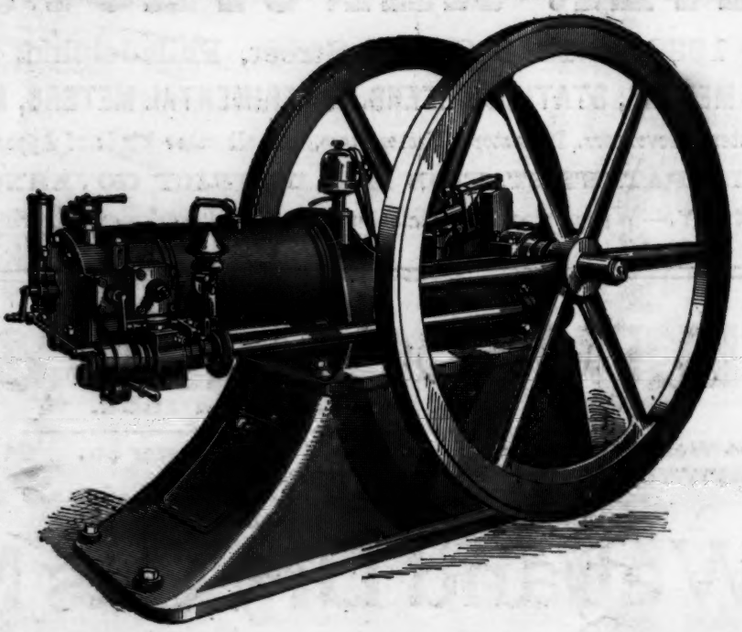

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